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CHICAGO, JULY 1912.

TABLE OF CONTENTS.

Editorial	1-4
Reading Trade Papers	1-2
The Contest Closes	2
Telephone Statistics of the World	2-4
"A Lot of Loaded Lines"	4
Strength Tests of Cross Arms. By Thomas R. C. Wilson	5-7
What One Woman Thinks. By Sarah Elizabeth Brown	8-9
Electrolysis Testing in Telephone Work. By John M. Humiston	10-14
Automatic Exchanges in England	14
The Sale of Telephone Service. By J. M. Carroll	15-16
New Telephone System for Mexican City	16
Appeal in Physical Connection Case	16
The Telephone Scrap Book	17-20
Practical Joint Pole Construction. By J. E. McDonald	21-22
Digest of Foreign Telephone Literature	22-25
Nebraska Commission News	26
New York Commission News	26
Who's Who in the Telephone Game	27-28
Interference from Power Lines in Iowa	28
Dielectrics at Telephonic Frequencies. By J. A. Fleming and G. B. Dyke	29-32
Electrical Instruments in England	28
Telephones in Pennsylvania Commission Report	32
The Law and the Telephone. By [illegible] Wenner	33-34
Department of Railroad Telephon[illegible]	35-45
Michigan Commission News	46
Telephone Nuisance in Battle Creek	46
Of Interest to the Trade	47-52
Brevities of the Business	52-56

READING TRADE PAPERS.

"LET me chronicle an observation carried on through a period of years in a work that took me through hundreds of the larger plants of the country," says a writer in *Advertising and Selling;* "I would find on the desks of the presidents and general managers of great institutions copies of the leading journals of that industry interlined, pencil marked and full of marginal notations; while the highly important clerks in the office had 'no time' for such nonsense. Then I knew why it is that clerks remain clerks, while other men grow to be managers and partners and proprietors."

The writer goes on to point out just why the big men of any industry read its trade papers. We need not enter into that here. You, as a reader of this editorial, know why; for you have been using the new ideas and information brought to you just as other successful men make a practice of doing. The point is that the progressive man lets no opportunity escape for adding to his store of knowledge concerning his business, while the self-sufficient subordinate "has no time" for what he regards as a purely perfunctory practice. The average employee, in short, does not read the trade papers because he is not definitely ordered to do so.

Between the employees who read trade papers consistently and interestedly, and those who do not read them at all, there is a sharp dividing line. The first class display positive proof of ambition, at least. The second class may be indifferent—mere time-servers; but the greater portion of them are overlooking an opportunity through sheer ignorance of its importance. Some of them have not yet learned what a trade paper is, and consequently regard it as more suited to any other department or branch of the work than to their own.

All employers, themselves trade paper readers, look with favor upon those subordinates who show the same interest in the outside news of the industry. And when promotion time comes, it is almost invariably the trade paper reader who goes forward. He has shown that his heart is in the work, that he finds the record of the accomplishments of others in the field absorbing enough to give up some of his own time to its perusal. His advance is as natural and inevitable as the flight of time.

The benighted individual who had not been initiated into the fraternity of trade paper readers may have potential qualities as meritorious as his fellow workers. If, as in most cases, it is ignorance and not indifference that keeps him in the dark, some one ought to be generous enough to point out the way to him. We cannot reach him with this editorial unless it is marked and placed in his hands, for when he finds it of his own volition he has already entered the circle. Sometimes an

employer is thoughtful enough to undertake this sort of missionary work.

No trade paper editor's motives can be entirely selfish. We are bound to feel gratified when we know we have helped even one man in his work. And so this is not specially an appeal for more TELEPHONE ENGINEER readers. There are other papers in this field. Read them all if you can; and if you are limited by any circumstances to one, at least see them all and select the one you like best. Be assured that your consistent reading of that one will eventually make return to you a thousand fold for the slight effort it may cost you.

THE CONTEST CLOSES.

WITH the appearance of this number of TELEPHONE ENGINEER July 1, the prize contest closes. We have received so far (and at this writing there is still time for many more), a large number of manuscripts; more, indeed, than we had expected, for the subject is rather difficult. How closely the requirements have been adhered to, how much merit there may be in the pile of unopened contributions, we will not know until the judges begin their work next week.

As we explained last month, those four papers which are selected from the pile as being worthy of use in the campaign for popularity of long distance telephony will be something more than catalogs of toll line virtues or arguments calculated to give courage to the timorous user. It is our hope that they will convey to their readers absolute conviction that the telephone is the easiest, quickest and most reliable means of transmitting a message to a distant point, and that in some ways long distance telephony is simpler than local because of the concentrated assistance and support of the operators at both ends of the line.

The telephone toll business of the country in the aggregate is enormous; but this is an enormous country. In number of telephones to the per capita unit there is a definite saturation point. Even in the use of local service there is a limit of line use which is nearly approached by many large subscribers. But in the use of long distance lines there is no such limit, or if there is, it is so far above present conditions that we cannot see it. Compare the total number of long distance messages in a given time with the total number of telegrams and the total number of pieces of first-class mail, and try to estimate how many of the telegraphic and postal messages might better have been telephoned.

In the course of time it will become customary to use long distance with the freedom now so common to local service, and the telephone companies will reap the benefit. But that time will only come when the telephone using public (and that will then mean *all* the public), has acquired the habit. It is our wish to provide means, in these prize essays, for sowing the seeds of that habit.

In the August number of TELEPHONE ENGINEER we expect to announce the names of the prize winners, with the board of judges who will consider the contributions. The articles themselves will be published as soon thereafter as may prove expedient.

A weekly trade paper goes to the waste basket in seven days. A monthly trade paper is kept from thirty days to forever. The life of the paper is the life of your advertisement.

TELEPHONE STATISTICS OF THE WORLD

UNDER the above title the statistician of the American Telephone and Telegraph Company has issued thirty-six pages of extremely interesting figures, interspersed with diagrammatic illustrations showing vividly the marvelous progress of the telephone.

The quinquennial reports of the United States Bureau of the Census have told us of the American appetite for telephones, and the very infrequency of their publication has emphasized the rapidity of growth. But heretofore we have had few opportunities to parallel our own statistics with those of the rest of the world, and to feel a patriotic glory in the contrast.

Of an estimated total of 12,453,000 telephones in all the world, the United States has 8,362,000; 67.1 per cent—over two-thirds. The rest of the whole is made up of Europe, 3,239,000 or 26 per cent; Canada 335,000 or 2.7 per cent; and all other countries 517,000 or 4.2 per cent. These figures are given as of January 1, 1912.

Out of a total of 29,566,000 miles of telephone wire in the world, it is interesting that Europe has 32 per cent. In the United States these are 2.17 miles of wire per telephone. In Europe each telephone averages 2.9 miles of wire. Europe makes good use of her long distance lines, and is not so partial to the party line.

The increase in United States telephones over January 1, 1911, is ten per cent. Canada's increase in the same period was 18 per cent, Europe's nine per cent and all other countries' 21 per cent. This country is, of course, much nearer telephonic saturation than any other part of the world. Abnormal rates of increase in some quarters are due to a recent awakening to the advantages of occidental civilization. Europe, with neither saturation nor hibernation as an excuse, makes the poorest showing of all as to increase. Europe to-day has less than one telephone per hundred of population, as against over four per hundred in Canada and nearly nine per hundred in the United States, and is at the same stage of telephonic development that this country was January 1, 1898—fourteen years ago.

It is estimated that the telephone conversations of the world during 1911, totaled 22,000,000,000. The divisions of this total for the United States, Canada, Europe, and all other countries, correspond closely to the number of telephones in each division of the globe. On the other hand, of telegraph traffic in 1911 the United States can claim but 17 per cent of the total, as against 62 per cent for Europe. The Old World, therefore, balances its telegraphs against our telephones. It is a poor balance, though; for the telegraph messages of the world number only 2.5 per cent as many as the telephone messages in a given period.

The world's telephone investment is given as $1,729,000,000—about the value of all gold coin and bullion in the United States. The investment per telephone in the United States is $126; in Canada, $129; in Europe, $175; in all other countries, $118. Austria, Belgium, France, Great Britain, Hungary, Spain and Switzerland all show an investment of over $200 per telephone.

The data given on the history and prospects of

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telephone development in foreign countries is so interesting that we reproduce it intact.

Of the various economic and social forces that underlie the recent telephone progress outside of the United States, one of the most important, and one of far reaching consequence, is the gradual abolition of rate systems that have proved inadequate to the rapid popularization of the telephone, and the adoption of systems approximating the system in the United States. The telephone service of most European countries has suffered from the retention of rate systems not suitable to the needs of the public. Now, however, the difficult problem of adapting charges justly proportionate to service rendered, thus equalizing the charges among various classes of consumers, claims the attention of the Telephone Administrations of important European States. Austria is just emerging from a thorough revision of the old rate system adopted at the opening of the service, the revised schedule having gone into effect January 1, 1911. In Belguim, ever since 1908, considerable agitation has prevailed for more equitable rates. After a careful study of the problem, the Minister in charge of the Postal and Telegraph Administrations submitted (September, 1911) a new telephone rate law for the approval of the King, upon the adoption of which an era of rapid development is predicted. The German Telegraph Administration, on the other hand, has not yet succeeded in obtaining the approval of the Diet for the proposed change of telephone rates. Indeed, the law as originally drafted has had a rather checkered career. In 1906, in accordance with a resolution of the Reichstag calling for a reform, the Government elaborated a new schedule. This was submitted to a committee of officials and representative business men, January, 1908. In a revised form it reached the Diet, which immediately referred it to a Budget Committee. In November, 1909, the bill was again submitted, and was again referred to a Budget Committee, which (December, 1910), adopted a compromise embodying further changes. Early in 1911 the bill, as modified, came back to the Diet for a second reading, with the same result—a return to the Budget Committee. The latter prepared a second compromise, but adjourned without further action. What the final outcome will be is a matter of conjecture. The Swiss Republic, in consequence of the rate schedule adopted in 1896, faces the problem of equilibrating telephone revenue and expenses. As early as 1903 the Federal Council submitted a report calling for an increase in rates, but political and other considerations prevented the adoption of this recommendation. In 1910 the Federal Council again issued a message on the question of increasing telephone rates. By instruction of the Swiss Parliament, however, the Council was requested to obtain more complete data on average costs and to recast the entire telephone accounts according to commercial accounting principles. The result of such an investigation was embodied in a special report, issued March, 1911, which showed that as figured by the Committee, the financial result of twenty-nine years of telephone operation is a deficit of several million francs. With that report was coupled the recommendation that the annual telephone revenue be increased by at least one million francs by increasing both exchange and toll rates. In consequence of the amalgamation of the four British colonies that constitute the Union of South Africa, the central telephone administration is preparing a new telephone rate schedule.

Italy, France, Russia, Japan, and the Commonwealth of Australia contemplate a thorough reorganization of their telephone service, while Imperial China took the first steps toward the general introduction of the telephone.

The Italian Government, by special legislation, has provided $600,000 for the rapid extension of its telephone service. Moreover, the recent report of the Government by the Royal Telephone Commission, strongly recommends an additional expenditure of $30,000,000 between 1911 and 1928. France, by a decree of July, 1911, has sanctioned the expenditure of $2,250,000 for the construction and extension of the Paris exchange. Great Britain, in the Telephone Transfer Bill recently passed, has voted $20,000,000 for the development of its telephone service after the transfer. Again, the German Government has authorized an eleventh special appropriation, amounting to $5,280,000, for the extension of its telephone service during 1912. Finally, the budget of the Commonwealth of Australia provides $3,000,000 for its telephone and telegraph services, besides creating a special fund of $3,000,000 to be drawn on during the next two years.

The prospect for telephone growth in South and Central America has considerably improved. On January 1, 1912, these two continents, with a population of about 54,000,000—or lacking 10,000,000 that of the German Empire—showed a telephone development of about one telephone to every 500 persons as compared with one telephone to every 62 persons in the German Empire. The best developed state in South America is Argentine, with a total of about 68,000 telephones, that of Central America is Panama, with a total of about 1,800 telephones. On account of the greatly improved commercial activities both of South and Central America, there is good reason to think that the telephone service is destined to achieve considerable proportions in the near future.

During 1911 the Imperial Government of China formulated a definite program for extending the telephone service, and included in that program provisions for the gradual establishment of manufacturing plants of electrical apparatus.

The Japanese Government is still hard pressed to furnish telephone service to waiting applicants. According to latest reports, there are over 45,000 persons on the waiting list, and that number increases by about 3,000 per month. So far the Administration has been able to connect only 25,000 subscribers per year. The Administration has worked out a second program of telephone expansion and appropriated $12,000,000 for the five years ending March 31, 1913. This plan has been found to be totally inadequate to the needs, and thus a third program, providing $25,000,000 for the five years after 1913, is under consideration.

Noticeable progress has also been made in the various states constituting Australia and New Zealand. These two dominions have about 124,000 telephones, or 2.3 per 100 population. It is worth while to recall in this connection that the combined area of Australia and New Zealand is about equal to the area of the United States.

The recently created Union of South Africa likewise shows progress as regards the telephone service. January 1, 1912, there were about 17,000 stations in the Union, or 0.3 per 100 population. Omitting the native population, which is nearly 80% of the total, however, the Union has a telephone development of 1.3 per 100 population.

The above facts indicate that telephone service outside the United States is destined to progress for some years at a more rapid pace than heretofore.

During the past year the long distance telephone service of the world has received notable extensions. In the United States commercial service was opened between New York and Denver, 2,160 miles, this being now the longest distance over which oral communication is given commercially. In Europe long distance service has been greatly extended by utilizing both the new loaded cable between Great Britain and Belgium—by which telephone service is expected to be given between London and Berlin—and the new telephone cable, constructed also on the Pupin principle, between Dover and Calais. The latter

enables conversation to be carried on between Glasgow, Edinburgh and Paris, and also between Aberdeen and the French capital, a distance of 910 miles. Successful trials have also been made between London and Geneva, a distance of 560 miles, and from London to Basel, a distance of 600 miles.

Recent progress in the art of submarine telephone cable manufacture will have far reaching consequences. At the present time there are over 400 miles of submarine telephone cable in use in the world, and of this total about one-half is represented by the four cables between France and England, and the two between Belgium and England. The longest submarine telephone cable lies between La Panne (Belgium) and St. Margaret's Bay (England), a distance of 55 miles.

The European international long distance land line systems have likewise received important additions, due to the opening of the line between Paris and Madrid, 900 miles, and the direct line between Berlin and Rome still under construction, a distance of over 1,000 miles. As regards the Continent, there is now scarcely any important city that cannot talk with any other important city. By far the largest interurban or toll telephone plant in Europe has been built by the German Government, which according to the latest official statistics, had about one-half of the total interurban or toll telephone wire of Europe.

D. & I. R. Road Making Telephone Extensions

The Duluth & Iron Range Railroad has made arrangements to operate a telephone line from Allen Junction to the Fayal laboratory, to be used in grading ore at the laboratory and the dock office at the city. One or two other telephones will be put on this line to enable the company to operate its business, especially during the summer months, with better dispatch. Work on this line was started as soon as the copper circuit for the dispatchers' telephone system was completed between Two Harbors and Allen Junction. This line was completed by the time navigation opened up. The copper circuit is now extended to Mile Post 38, eleven miles north of the former city, and a large crew of men is being kept busy daily stringing wire.

Wire Span a Mile Long

The Susquehanna river in its course through Pennsylvania cuts directly through several mountains, forming what are known as water gaps, says Raymond M. Baskin in *Popular Electricity*. One of the most marked of these is found between Millersburg and McClellan stations of the Northern Central Railroad. The river at this point is about one mile wide, and stretched across the river from one mountain to the longest span of telephone wire in the United States.

The wires, four of them, form two talking circuits of the American United Telephone Company. They are three-eighths inch twisted wire cables, 5,600 feet long and have a dip of 460 feet.

Modern Methods

"I find that my husband has been having the office boy call me up every day and mumble terms of endearment. That's a nice way to fool his wife. He's been going to the ball game."

"How is it you didn't catch on to the voice?"

"Well, I'm busy at bridge every day and I've been having the cook answer the telephone."—*Pacific Telephone Magazine.*

A Lot of Loaded Lines

"CENTRAL."

With a clamp on her head like a cage for her hair,
She sits all the day on a stiff little chair
And answers the calls that come over the wire
From people of patience and people of ire;
And "Number?" she queries of noble or churl—
A wonderful voice has the telephone girl.

She has to be pleasant, and hustling and keen,
With a temper unruffled and ever serene.
There are forty-five things she must think of at once
Or some rough subscriber will call her a dunce;
Since it seems a general custom to hurl
The blame for your grouch on the telephone girl.

It's wearisome work on the nerves and the brain,
Continual hurry, continual strain,
And Central gets tired—as other folk do—
And needs to be thoughtfully treated by You;
So think of her doing her best 'mid the whirl
And try to be white to the telephone girl.

BERTON BRALEY.

An obscure little "special" from London to the *Christian Science Monitor* states that there is work at high pressure at the Royal Cloth Works, Pimlico, in consequence of a large order given by the British postmaster-general for uniforms for the National Telephone Company's employees, now servants of the state. Thus is revealed one of those incidentals of government ownership which are too insignificant to gain the attention of students, yet which may have a bearing on the success or failure of subsidized service. What is the psychology of a uniform? Would your operators, inspectors and clerks wear them, and if they did, would their efficiency be as high as now?

REMUNERATIVE SIDE LINE FOR TELEPHONE COMPANIES

[From the Salina, Kan., *Journal.*]

The last picnic of the Salemsburg Telephone Company was the most successful ever held and the financial returns show that it was the largest. The refreshment committee noted the sale of the following items in the days business at the stands: Pop, 80 cases; ice cream, 50 gallons; peanuts, 75 pounds; candy, 20 pounds; chewing gum, two boxes; popcorn, 275 boxes; oranges, two cases; one bunch of bananas; 900 cigars. The total receipts were $390.60 and the net receipts after all expenses were paid were in the neighborhood of $225.

In South Carolina C. E. Penny is president and J. P. Wise secretary of the Jasper Telephone Company. That's the way with some of 'em.

J. F. Steel has incorporated a farmers' line at De Soto, Mo., and L. Rust another at Del Rio, Texas. So it goes.

Directors of a farmers' line at Kempton, Ind., are named Everett Bunch, Charles Fearnow and John Goodnight. Almost reminds you of that song about going home in the dark.

TAKE THIS HOME AND READ IT TO THE CHILDREN.

[A Pittsburgh plant school student's answer to the question "How do we hear?"]

Sound-waves that enter the external auditory meatus vibrate the tympanic membrane and are transmitted by the ossicles which vibrate as a whole, to the perilymph of the internal ear. The vibration of the perilymph is transmitted to the endolymph of the membranous labyrinth, where it takes effect on the terminations of the auditory nerves. The eustachian tube, a communication between the middle ear and the pharynx equalizes the pressure on both sides of the tympanic membrane, thus facilitating vibrations of the tympanum.

THE PROTEST COURTEOUS.

[From the Berlin, Wis., *Journal.*]

The operator hears crooked and service is mixed up. Central energy would help much but not one claims it would bring the telephone melinium.

"Telephone rates are based on the amount of service provided for the patient," explains the Bay City, Mich., *Tribune;* but regrettable as it may be, the impatient often get the best service at that.

P. H. W.

Strength Tests of Cross Arms

By Thomas R. C. Wilson*

SERVICE LOADS ON CROSS-ARMS.

CROSS-ARMS must resist forces which are variable in amount and direction. In a line the arms may be subjected to heavy loads under several conditions:

(1) If the wires on one side of a pole are broken, a heavy side pull comes on the cross-arm from the other side. This causes a severe stress in the pole, and, as will be shown later, the pole is more likely to be broken than the cross-arm.

(2) If the wires are heavily covered with sleet and there is a strong wind blowing, there is a pressure on the cross-arms, but here again the stress in the pole will cause it to fail before the cross-arm will give way. Similarly, in changes of direction in the line the sidewise pull of the wires is more severe on the poles than on the arms.

(3) If the cross-arms are at the same level in the line, they can receive no greater strains than those which may be imposed by the weight of the wires, and of adhering ice, and by wind pressure. If, however, the middle pole of three is higher than the poles on either side and the wires are tightly stretched, there is a strong downward pull on the cross-arms. A similar condition might result if a single pole were left standing in a line where the poles on either side had fallen.

It is not necessary to reproduce exactly these stresses in laboratory tests if one test can be devised to cover the most severe conditions and the resistance to the less severe estimated on the basis of that one test. A test was devised in which the load was distributed along the arm, as it is in actual practice. In all of the tests the load was applied vertically for two reasons: First, because the arms are likely to receive their heaviest loads in this direction; second, because from the results it is possible to estimate the resistance of the arms to forces acting in other directions. The test used is also well adapted to show the influence of defects on strength.

MATERIAL TESTED.

The material for the tests described in this circular consisted of 84 six-pin cross-arms 3¼ by 4¼ inches by

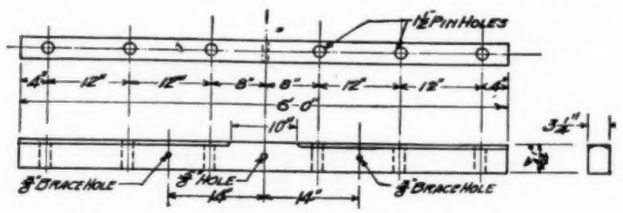

Fig. 1. Standard 6-foot 6-pin cross-arm.

Note.—The arms tested varied in height from 3.95 to 4.23 inches and in width from 3.05 to 3.24 inches. Positions of pinholes varied frequently from ½ to ¾ inch. Brace holes were 16, 18, or 19 inches from center in some groups. Such arms were rebored and brace holes placed 14 inches from center.

6 feet (Fig. 1). This number was made up of seven groups and comprised four species: Douglas fir, shortleaf pine, longleaf pine, and southern white cedar.

Group 1—12 arms, Douglas fir.
Group 2—12 arms, shortleaf pine.
Group 3—13 arms, longleaf pine, graded by the manufacturers as 50 per cent heart.
Group 4—11 arms, longleaf pine, 75 per cent heart.
Group 5—12 arms, longleaf pine, 100 per cent heart.
Group 6—12 arms, southern white cedar.
Group 7—12 arms, shortleaf pine, creosoted.

Group 1 originated at a mill at Walville, Wash.;

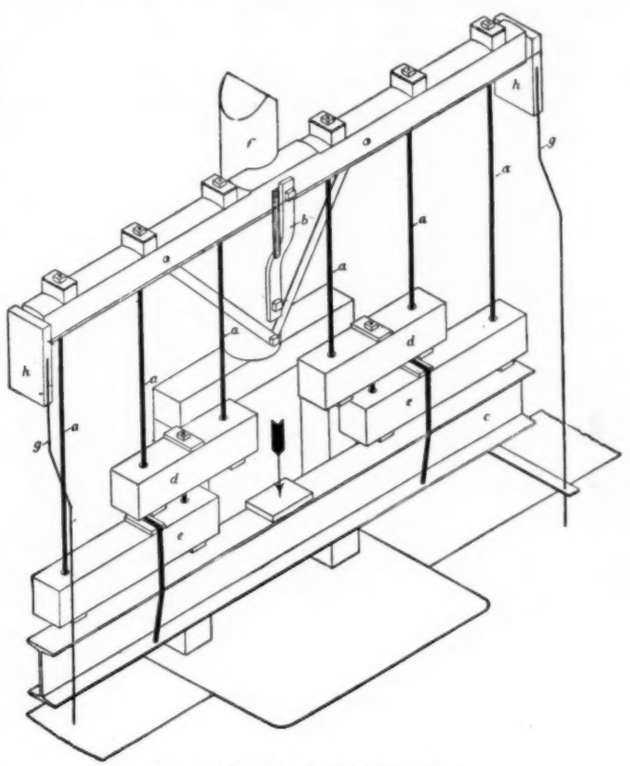

Fig. 2. Method of testing cross-arms.

groups 2 and 7 at Buell, Va.; groups 3, 4, and 5 at Hattiesburg, Miss.; and group 6 near Norfolk, Va. Groups 1, 2, 3, 4, 5, and 7 were furnished by the American Cross-Arm Company and group 6 by the John L. Roper Lumber Company. The tests were made at the forest products laboratory, maintained in co-operation with the University of Wisconsin, at Madison. All arms were openpiled in the laboratory from two to eight weeks before the testing work was begun.

METHODS OF TESTS.

Tests were made on a 200,000-pound Riehle universal testing machine. The arrangement of the apparatus is shown in Fig. 2. The stub pole *f* rests on a short beam on two posts, which in turn rest on the weighing platform. The pole is held in a vertical position by the columns of the testing machine. A gain about one inch deep is cut in the side of the pole, and the cross-arm is fastened into it by a ⅝-inch bolt which extends through the pole. That portion of the bolt within the pole is encased in a piece of gas pipe which fits the bolt closely and increases its bearing on the wood. The outer end of this bolt is supported by a heavy brace *b*, consisting of a

*United States Forest Service Circular, No. 204.

piece of ½ by 1¾ inch round-edge tire steel, the lower end of which is attached to the pole by a ⅞-inch bolt. The diagonal braces are ¼ by 1¼ inch steel, 24 inches long, from center to center of the bolt holes. The lower ends of these braces are attached to the pole 19½ inches below the center of the cross-arm by a ⅝-inch bolt through the pole, this bolt also being encased in the pole in a piece of gas pipe. The upper ends of the braces are also securely attached to the cross-arms by ⅜-inch carriage bolts at points 14 inches from the center of the arm and in line with the center bolt.

The center bolt is braced for the reason (found by experimenting on one or two arms) that without the brace the bolt bends and stretches to such an extent that the arm twists or skews out of its original vertical position. The bolts through the poles are encased in gas pipe to give larger bearing on the wood and to prevent too much stress and deformity. While these devices do not conform to those of actual practice, they give more uniform conditions of test.

Blocks *h*, are each attached to the cross-arm by a nail driven into the center of its end. These blocks are held vertical by the guide rods, *g*. A nail is driven part way into the front edge of each block and in line with the center of the cross-arm. Between these two nails is stretched a fine wire, which is kept taut by a rubber band. The movement of this wire with respect to a scale in the center of the arm marks the deflection, which is easily read.

The load is applied to the cross-arm by rods passing through the pinholes in the arms. Nuts on these rods pull down on wooden bearing blocks shaped to fit the upper side of the arm. The lower ends of these rods are attached to the system of equalizing levers (*c*, *d*, and *e*), whose arrangement is such that the rods transmit equal loads to the cross-arm, as in real conditions.

In conducting the tests an initial load of 250 pounds was applied. The scale and wire were then adjusted to zero reading, the machine started,* and a deflection reading taken at 500 pounds and at each increment of 500 pounds until a perceptible weakening of the arm was noted, after which the load was read for each 0.1-inch deflection, and at points of sudden change, until complete failure or 4-inch deflection was secured. A load-deflection diagram was plotted as the test progressed, and from this diagram the values given in the tables were derived. The behavior of the arm during the test was observed carefully, and the character and sequence of the failures described. Each arm was weighed at the time of test.

One arm was tested from each group, then a second arm from each group, and so on, in order that there

*The head descended uniformly at the rate of 0.26 inch per minute.

Table 2. Summary of results of tests on cross-arms.

Species and grade.	Rings per inch.	Summer wood.	Sap.	Moisture.	Specific gravity, dry.	Bending tests. Load at ¼-inch deflection.	Bending tests. Maximum load.	Bending tests. Work to maximum load.	Bending tests. Total work.	Compression parallel to grain. Maximum crushing strength.
	Number.	*Per cent.*	*Per cent.*	*Per cent.*		*Pounds.*	*Pounds.*	*Inch-pounds.*	*Inch-pounds.*	*Pounds per square inch.*
Douglas fir	20	40	0	11.5	0.479	4,050	7,590 (†7,590)	5,990	15,730	7,080
Longleaf pine, 50 per cent heart	17.9	43.7	55	13.4	.542	4,463	8,984 (9,000)	6,888	13,565	5,425
Longleaf pine, 75 per cent heart	18.5	53	32	13.5	.627	5,220	10,180 (10,240)	7,800	18,370	8,950
Longleaf pine, 100 per cent heart	15.5	44	1	12.8	.627	4,770	9,782 (9,850)	7,970	18,543	8,940
Shortleaf pine	10.5	46	79	13.3	.516	4,460	9,260 (9,220)	8,400	16,510	7,300
Shortleaf pine, creosoted	11.2	49	.....	.....	.....	3,841	7,649 (7,360)	6,084	14,325	5,770
White cedar	12	45	1.5	14.3	.364	2,860	5,200 (4,800)	3,150	6,930	4,700

†Values in parentheses are the estimated maximum loads for arms 4.10 by 3.16 inches in cross section (the average size of Douglas fir arms).

Table 1. Detailed summary of tests on cross-arms. DOUGLAS FIR (SHIPMENT 91).

Piece No.	Rings per inch.	Summer wood.	Sap.	Moisture.	Specific gravity dry.	Bending tests. Arms mounted on stub pole and braced. Loaded at six pinholes. Height at center.	Width at center.	Load at ¼-inch deflection.	Maximum load.	Deflection at maximum load.	Load at 4-inch deflection.	Total deflection.	Work to maximum load.	Total work.	Kind of failure.†	Maximum fiber stress in compression parallel to grain.
		Per cent.	*Per cent.*	*Per cent.*		*Inches.*	*Inches.*	*Pounds.*	*Pounds.*	*Inches.*	*Pounds.*	*Inches.*	*Inch-pounds.*	*Inch-pounds.*		*Pounds per sq. inch.*
1	18	63	0	12.9	0.646	4.16	3.19	.....	.....	.....	.....	.....	.....	.....	This arm used in experimenting on method of test.	7,500
2	23½	35	0	10.7	.397	4.17	3.19	4,190	7,140	1.90	2,650	4.00	10,066	19,608	Tension failure at center and pinhole* followed by compression failure at pinholes.	6,290
3	.....	.....	0	.....	.....	4.07	3.11	3,700	7,940	1.50	4,600	4.00	7,590	22,840	Tension failure at center and compression failure at pinholes.	.....
4	23½	37	0	11.8	.410	4.11	3.16	3,450	6,480	1.10	0	1.30	4,200	5,440	Tension and compression failures at pinholes.	6,060
5	15½	55	0	11.9	.592	4.10	3.15	5,100	9,000	1.30	2,350	4.00	7,590	17,240	Splitting at center bolt followed by tension failure between center and pinhole.	8,760
6	15½	30	0	11.4	477	4.06	3.16	2,175	4,500	1.10	2,150	4.00	3,170	10,420	Cross-grain tension failure, with compression failure at pinholes.	7,320
7	32	31	5	12.0	.506	4.07	3.12	4,200	8,300	1.00	4,900	4.00	4,440	21,580	Splitting at center bolt followed by tension and compression failures at pinhole.	7,860
8	12½	27	0	11.9	.422	4.11	3.15	4,000	8,000	1.55	1,500	4.00	8,160	13,580	Splitting at center bolt followed by tension and compression failures at pinholes.	6,270
9	.....	.....	0	.....	.....	4.16	3.16	5,000	7,900	0.80	4,050	4.00	3,400	17,150	Tension failures at pinhole, splitting at center bolt, and light compression failures at pinholes.	.....
10	.....	.....	0	.....	.....	4.11	3.20	4,650	8,550	1.20	1,500	4.00	6,300	15,980	Splitting at center bolt followed by tension and compression failures at pinholes.	.....
11	20	40	0	12.1	.452	4.05	3.16	4,000	8,050	1.10	2,850	4.00	4,980	13,500	Splitting at center bolt with tension failure at pinhole.	6,600
12	.....	.....	0	.....	.....	4.09	3.15	5,000	5,500	0.70	.....	0.80	2,224	2,460	Tension failure at center (imperfect test).	.....
Average..	20	40	.42	11.5	.479	4.10	3.16	4,050	7,590	1.26	2,655	3.73	5,990	15,730	Pieces 1 and 12 omitted	7,080

might be eliminated from the comparison any variation in results due to change in the apparatus. All arms, except four from each group, which were selected to be saved for exhibit, were cut up, and a one-inch moisture disk and an 8-inch specimen for test in compression parallel to grain* were secured from each.

RESULTS OF TESTS.

A detailed summary of the results with Douglas fir is presented in Table 1. The load at ½-inch deflection is an approximate measure of the stiffness. "Work to maximum load" and "total work" are measures of the toughness. The maximum load is the measure of the strength or ability to withstand a slowly applied load.

A few of the tests were incomplete or unsatisfactory; while these are included, they were omitted from the calculation of the averages which are given in this table. Also, in certain cases the failure of the arms was due, at least in part, to knots and cross-grain. The values obtained in the tests of such arms as well as the tests omitted from the averages in Table 1, were omitted in computing the average values given in Table 2.

Since the stresses between the points of attachment of the braces are indeterminate, no allowance has been made for variation in size except to estimate what the maximum loads would have been had the average dimensions of the arms of all groups been the same as those of the Douglas fir group (3.16 by 4.10 inches). These estimated loads are inclosed in parentheses in Table 2.

COMPARATIVE STRENGTH OF VARIOUS KINDS OF WOOD.

The various species and grades in order of average strength are as follows:

	Average maximum load
Longleaf pine, "75 per cent heart"	10,180
Longleaf pine, "100 per cent heart"	9,780
Shortleaf pine	9,260
Longleaf pine, "50 per cent heart"	8,980
Shortleaf pine, creosoted	7,650
Douglas fir	7,590
White cedar	5,200

Since the arms with 75 per cent of heart are stronger than those with 100 per cent, and those with 50 per cent are weaker, other factors than the relative amounts of heartwood and sapwood must have a determining influence on the strength.† This is the more apparent in the light of the fact that the actual per cents of heart are, by careful estimate, 100, 68, and 45, respectively, instead of 100, 75, and 50, according to the nominal grading.

There was a very considerable difference in the strength of the natural and treated shortleaf pine arms. Just how much of this difference should be attributed to the treatment it is impossible to determine, but a careful examination of the failures indicates that the creosoted arms were, aside from the treatment, inferior to the untreated.

Both the strength values and the manner of failure show that white cedar is considerably less strong than the other species. The failure is in nearly all cases by short brash tension. The numerous small knots and the large season checks seem to have had little influence on the failures.

INFLUENCE OF DEFECTS.

In nearly all cases the principal failure was at the first pinhole from the center, though in many cases the first failure was apparent as a cracking at the center bolt hole. In view of these facts it is recommended that, in grading or selecting arms, particular attention be given to defects near the center or the first pinholes. Knots on the upper side of the arm near these points are especially to be avoided.

SUMMARY.

The average load borne by the southern white cedar cross-arms, the weakest group, was 5,000 pounds, the load being applied vertically. By careful estimate the resistance of these arms to side pull is at least 4,000 pounds. Under any conditions of service this is more than sufficient, because it is so much greater than the side load that can be sustained by poles. In tests* these have not withstood an average side pull of much more than 3,000 pounds, and usually have failed at less than 2,000. Further, both the pole and cross-arm tests were made on air-dry material, while under actual conditions of use the poles would be weakened by moisture much more than the cross-arms.

In the case of sleet or snow, if the ice coating on the wires gives each strand a diameter of one inch, a wind pressure of 27 pounds per square foot would be sufficient to break the pole, assuming that the poles have a resistance to side pressure of 2,000 pounds, and are 150 feet apart. Even under these extreme conditions the cross-arm would have to resist stresses equivalent to those imposed by a load of only 875 pounds, applied as in the tests, so that even the weakest of the arms tested would have more than sufficient strength to withstand a force which would break the average pole.

Where there are abrupt changes of grade in a line, as in the case of one pole higher than those adjacent on either side, the downward pull on the cross-arm depends on the stress of the wires and their inclination from the horizontal. If 6 No. 8 wires are stretched to their maximum strength, assumed to be 60,000 pounds per square inch, they can exert a pull of 7,670 pounds. If a cross-arm on the middle pole had the average strength of Southern white cedar, it could not be broken by such a pull unless the pole were at least 45 feet higher than the two at each side, the spans being 150 feet. Such an abrupt change in grade is rare in practice. If the cross-arm were weakened to 60 per cent of its air-dry strength, which would correspond to a green or water-soaked condition, the arm would not break unless the difference in height were at least 25 feet.

All things considered, cross-arms of the species and dimensions tested are strong enough for ordinary use; with longer arms the strength is relatively of much more importance. With the standard 6-foot cross-arm, however, the question of strength need not enter into calculations of line construction, except in the rare case of abrupt change in grade. The ability of the timber to resist decay, and methods of preventing decay, are considerations of greater importance.

*The compression tests were made in accordance with the procedure described in Forest Service Circular 38, "Instructions to Engineers of Timber Tests."

†This finding is in accord with the general results from timber tests of the Forest Service, that heartwood and sapwood are about equally strong.

*Pole tests by the Forest Service gave the following figures for the side pull (applied at the top end of the pole) which a 25-foot pole of 7-inch top diameter is able to withstand:

Western red cedar at 15.1 per cent moisture.....1,310 pounds
Lodgepole pine (fire killed) at 16.9 per cent moisture.....1,430 pounds
Engelmann spruce (fire killed) at 16.3 per cent moisture.....1,405 pounds

Tests by the Pacific Telephone and Telegraph Company gave the following figures for 25, 30, and 35-foot poles having top diameters of 6, 7, 8 and 9 inches:

Western red cedar (Idaho) at 10.1 per cent moisture.....2,215 pounds
Western red cedar (Oregon and Washington) at 15.2 per cent moisture.....1,930 pounds
Port Orford cedar (Oregon) at 12.0 per cent moisture.....3,040 pounds

What One Woman Thinks

By Sarah Elizabeth Brown

VIEWED dispassionately and from afar, this has been an amazing month. At the time I last wrote, the country was suffering for rain. In our particular neck of the woods, the spring wheat was gasping. The stock was beginning to turn color, the blades were apparently dead, but when a bunch was pulled from the ground there was a trace of moisture which gave the farmers hope. It might hold out a day or two longer to make it worth cutting. Several days followed and the spring wheat crop was kissed goodbye. Then it rained on that poor parched straw, just a gentle shower the first day and more rains followed, nearly every day for a week or so. We're going to get from ten to twenty bushels per acre from our lost hope!

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And politics—I wonder if you city folks take yours as seriously as we do out in the country? I'm sure you don't. The Paynes and Penroses and Roots certainly do not, for if they did it would make a better showing in the records. Out our way we're emulating our only ex-president by showing our teeth. We have a Roosevelt Club in our midst and it is such a blooming success that the postmaster can't find courage to show his colors. The countrymen aren't jays any longer. They are progressives. Wait till they vote.

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But of telephone affairs I'm supposed to write and when one is distracted by national political conventions and the joy that follows the rain, it is a dry subject. I think you'll concede that. I don't know anything of greater interest than the activities of the Lincoln T. & T. Co. in southeastern Nebraska. I had occasion to visit that beautiful little city only recently and saw with my own eyes the wrecking of some perfectly good homes which occupied a prominent corner at M and Thirteenth streets. I was told that the site was needed for a splendid new building for the Lincoln T. & T. Co. At present, the officers are scattered around in rooms on the top floor of the Bankers' Life Building just south of the present exchange. Frank Woods is the happiest and busiest telephone man that has come under my observation in a long time. It was in TELEPHONE ENGINEER that I learned he was a baseball player. Well, the great national game must look tame to him nowadays, because operating a telephone system that is scattered promiscuously over something more than 12,000 square miles of rich agricultural lands ought to be equivalent to coaching the winning run from third to the home plate. The beauty of Mr. Woods' proposition is that his franchises and realty are growing in value every minute, because the country is developing so rapidly. He started early enough to get in on the rise. A few years ago, when he moved into his new automatic exchange in Lincoln, he thought he was settled forever—that he had anticipated the future like a prophet. Today, what was formerly the culmination of his dream is a joke, but there is no loss to his company, because that first building and its site has grown in value so fast that he can sell it for twice its cost. It is that way all over his territory. And then there is the other thing you never find in big unwieldy corporations. The officers are workers. They don't shift responsibilities down the line through a chain of assistants. They work. They have to, to keep abreast of things. When the western spirit of this country can break through the barrier, geographically in the vicinity of Toledo, Ohio, we'll all be better off. If there were more Lincoln T. & T. companies in this country, we'd have bigger telephone factories and a whole lot more to be thankful for. In passing, I confirmed the report that the Bell system has given way to its aggressive competitor and that the Lincoln T. & T. Co. will dominate in Lincoln and all that country south of the Platte river to the state line and west to Adams and Webster counties.

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Here is one of those characteristic squibs that find a place in the Philadelphia papers with splendid regularity. It needs no comment:

The Keystone Telephone Company reports for May gross earnings of $101,653, an increase of $2,814; net, $51,599, an increase of $1,063; surplus, $26,795, an increase of $524; for 5 months: gross, $496,080, an increase of $11,817; net, $248,351, an increase of $4,735; surplus, $123,465, an increase of $1,717.

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I have said so much about the U. S. I. T. Co. that my readers will find no trouble in analyzing this brief statement which appeared in the New York World Thursday, June 20:

An order signed yesterday at Newark, N. J., by Vice-Chancellor Howell directs the payment by the voting trustees of the stockholders of the United States Independent Telephone Company of the aggregate sum of $2,084,265 to Frederick L. Johnson, receiver of the defunct company, for the benefit of its creditors.

The order was the outcome of a long drawn-out contest between representatives of the creditors and the stockholders. The main contention was on the liability of the stockholders to being assessed for the purpose of liquidating at par value an issue of bonds.

The telephone company, which is a New Jersey corporation, was adjudged insolvent more than four years ago. The hearings in the litigation were held before former Judge Jay Ten Eyck of Newark, as Special Master. The Vice-Chancellor directs the voting trustees to pay an assessment of $5.40 a share on 300,000 shares of deferred common stock and a like assessment upon 85,975 shares of other common stock.

Our friend Jim Kelsey will doubtless offer this comment: Moral—Whether you pay for it or not, be sure the stock isn't loaded.

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The Citizen's Telephone Company at Grand Rapids is enjoying prosperity if the selling of its stock in the open market is any criterion. The stock has always been regarded as of exceptional merit, due to an uninterrupted 8 per cent annual dividend record. There is a persistent report current in Grand Rapids that the treasury stock of the company will be advanced to ten above par and the usual gossip about merger attends it. It is reported that there is $3,750,000 treasury stock outstanding, with $5,000,000 author-

ized and the stock has been enjoying a market at 98. At $1.10, the contemplated new price, the yield would be 7.26. Like other sensibly managed properties that got into the game at the right time, the Citizen's deserves all the good things that can come its way.

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F. N. Kondolf has resigned the presidency of the Stromberg-Carlson Telephone Mfg. Co., to accept a bigger job—at least, the presidency of the Computing, Tabulating & Recording Co. would indicate it, if the $17,000,000 of capital is considered. But Mr. Kondolf promises to remain with the S.-C. Co. until his successor is chosen and broken in and because of this, we will all forgive him.

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The St. Louis Post-Dispatch breaks into song with the anthem, "Blessed Are the Rich." Now what do you know about that? I fancy that some youngster with one eye on a raise from twelve to fifteen and the other on a girl with prospects is playing a cuddle up lyre. I wouldn't want to spell the word in a rougher way, for it might be too nearly the truth and hurt somebody. But the responsible party twangs merrily, nevertheless. Hear him:

It is a great mistake to believe that the rich are holding us down. As a matter of fact, they are pulling us up. If there were no rich people to keep our eyes glued upon the great gulf between having and not having, none of us would hustle. We have to have the rich man's mansions prodding us, his power scourging us and his automobile butting us to get anywhere at all. We have to see his wife and daughters in silks and jewels and realize what our own wives and daughters without these things think of us as providers, to peel our coats off and get into the game. None of us can go out driving with such as we have and suffer the rich man to whiz past us in prism glass and burnished brass, throwing dust in our eyes and gasoline in our hair, without doing better in the great area of human endeavor for the next step two or three days, anyway. Blessed are the rich, for they fill us with shame and new resolve and make us to wonder what in the Sam Hill we have been doing all these years.

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I wish there was an easier way to find out about proposed mergers of telephone systems. Along will come a rumor that this thing or that is on the boards and accompanying is the ever-present denial by officers of both Bell and Independent officers. The affair drags along and is forgotten until someone gets to the place and finds a single system. All over the country there are reports of this kind that tell nothing specific. I've grown to regard every item as being conclusive. I'm sure that Bert Hubbel will connect with the A. T. & T. Co. money or system, if we have patience to wait and Hubbel's health remains good. I have had five chances to say something along this line and always drop back in my chair, fold my hands in my lap and take a nap on it. I know that the Detroit Home has gone Bell way and that the Delaware and Madison has gone or is on the same toboggan and I can't see that it doesn't all go to make a better business. I want to know. More money, wherever it comes from, makes a healthy condition in any industry. I also know of dozens of cities where mergers have been successfully negotiated and there is lots of sentiment in favor of doing the same thing over again. Let the good work proceed.

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The poor old Postal Telephone Company is sore as a neck boil, because the Western is shooting telephoned telegrams through its own circuits. The Postal can retaliate by hooking up to its magnanimous friends, the independents, but it prefers to hang on to its millions for greater contingencies. Gee, the Postal is the lucky dog—nothing to do tomorrow!

Injunction Against Cupid

The telephone service in a certain hotel of Spokane, Wash, has suffered so severely from the ravages of Cupid, it is stated, that the owner now requires each new operator employed to give a $500 bond not to marry within six months from the date of her engagement as telephone operator, of course. The reason given for this novel agreement is that half a dozen operators employed in this hotel have resigned to assume the duties of domestic life within as many months. This seems to be a condition which all telephone companies have to face, but no one heretofore appears to have resorted to this heroic method of meeting it.

Telephone Maps for Schools

The Bell Telephone Company has had printed maps of the United States four feet high by six feet wide, showing the telephone system, its long distance lines and all connections. It is like a railway map, only it shows telephone lines where the railway maps show rails.

Already thousands of these maps adorn the walls of school rooms in all parts of the country. Both city and rural school walls display them.

It is the purpose of the officers of the company to offer to school boards one of these maps for each school building.

To Teach Telephone Enunciation in France

The latest departure of the paternal French administration is a school of pronunciation. It is intended for the benefit of telephone girls whose elocution has been neglected, or whose provincial accent stands in need of correction. It is rarely that a day passes when one is not called to the telephone needlessly because someone has asked for a number that resembles it. Nines are quite often mistaken for fours, thirty-two and twenty-two are confounded, and many other numerical combinations give rise to mistakes on the part of the telephone girl.

Missourians Must Be Good

It is now a felony in the state of Missouri to misuse the telephone instruments or lines. For some time the following statute has been in effect:

"Every person who shall willfully and maliciously injure, molest or destroy any of the lines, insulators, wires, posts, piers, or abutments of any telegraph, telephone, electric light and power or electric railway company, or any materials or property used in or about the transmission of dispatches or other communications, etc., shall, upon conviction, be punished by imprisonment in the penitentiary for a term of two years or by fine not exceeding five hundred dollars."

Europe has only one telephone to every one hundred and forty inhabitants.

Electrolysis Testing in Telephone Work

By John M. Humiston*

THE Chicago Telephone Company employs a comparatively large force for making electrolysis tests. There is a great deal about this work that appeals to the imagination. In addition to determining the conditions of cables with respect to the ground and the street railway tracks, there are a number of other things we want to know something about. These I would list as follows:

1. Difference of pressure between cable and gas pipes.
2. Difference of pressure between cable and water pipes.
3. Ammeter measurements—cable to track.
4. Ammeter measurements—cable to water pipes.
5. Ammeter measurements—cable to gas pipes.
6. Ammeter measurements near power stations, water pipes to gas pipes.
7. Evidence of defects of plant for current distribution causing more leakage than would be the case in a normal system.

Such would be:

(a) Hot poles.
(b) Badly corroded rails.
(c) Broken rail joints.
(d) Unbonded rail joints.
(e) Corroded jumper wires around special work such as switches.
(f) Corroded structures, such as bridges and elevated railway columns.
(g) Corroded structures belonging to this company and to other corporations having structures under pavement.
(h) Failure to employ available parallel paths, such as will be mentioned hereafter.

8. Instances of negligence of the telephone company, such as:

(a) Anchor rods that are positive to the ground.
(b) Cables lying on gas or water pipes in vaults.
(c) Cables making contact with metal structures which are grounded, such as in the frames of buildings.
(d) Cables making contact with other grounded structures through guy wires.

Most of the trouble comes about through the great shifting of distribution centers and distribution paths because of rehabilitation of the railway systems now in progress. It is desirable to be able to make sufficiently precise and comprehensive statements to locate the responsibility for any expensive and localized case of corrosion.

There are three elements necessary to produce electrolysis:

Moisture.

The presence of metallic salts in the ground.

Some metal structure affording a path for the current and with current traveling over it and leaving it and passing to the moist soil containing metallic salts.

The treatment of this question is always according to two perfectly well known laws of electrical science. One of these is known as Ohm's law, and the other is known as Kirchoff's law. Ohm's law is:

Current is equal to pressure divided by resistance.

$$\text{Current} = \frac{\text{Pressure.}}{\text{Resistance.}}$$

The general expression of Kirchoff's law is:

In a set of divided circuits drawing current from the same source, the currents in the several divisions of the circuit are respectively proportionate to the reciprocals of the resistance of such divisions.

Stated briefly for two parallel circuits as illustrated in Fig. 1.

$$\frac{\text{Current in ABH}}{\text{Current in ACH}} = \frac{\text{Resistance in ACH}}{\text{Resistance in ABH}}$$

Fig. 2 shows roughly the relation between the rail and the underground structure affording a path for the current. The power station is shown at the left. At points remote from the power station, the current is flowing from the track to the round, and at points close to the power station it is returning from the ground to the track. In the underground metal structure the current is a maximum, in this case, half way between the location of the load and the power station.

Fig. 3 illustrates the circuit in a rail and trolley system in which the load is assumed to be concentrated at one point. The terminals of the generators in the power station are shown at the left, and the load imagined as concentrated at the right. The terminals of the generators furnish 500 volts pressure between the rail and the trolley wire. It takes pressure to force a supply of current through the trolley wire, and we have a drop in pressure between the power station and the load of 100 volts. The drop in the motors in the distant cars is 350 volts and the drop in the track structure between the cars and the power station is 50 volts.

On the diagram it is shown that for a load of 1,000 amperes, with the drops in pressure noted, the resistance of the trolley side of the circuit would be 0.1 ohms and the resistance of the track side of the circuit 0.05 ohms. This shows that at all points in the ground around the power station the electric pressure is above the pressure in the ground right at the power station, and that the farther one goes from the power station the greater the difference in pressure.

Fig. 4 shows plotted measurements taken between the rail and underground metal structure and the arrangement of values of these readings with reference to a base line which is at the same electric pressure as the track at the power station. The diagonal making the greatest angle with the base line is assumed to represent the drop in pressure in the rails. The other diagonal represents the drop in pressure in the ground and the foreign metal structure affording a path. The values given indicate volts. At points remote from the power station the current is flowing from the rails to the ground, and at points close to the power station the current is flowing from the ground to the rails. At the intermediate point where no current is flowing between the ground and the rails, the maximum amount of current is flowing in the

*From a talk before the electrolysis department of the Chicago Telephone Company. Illustration from the *Bell Telephone News*.

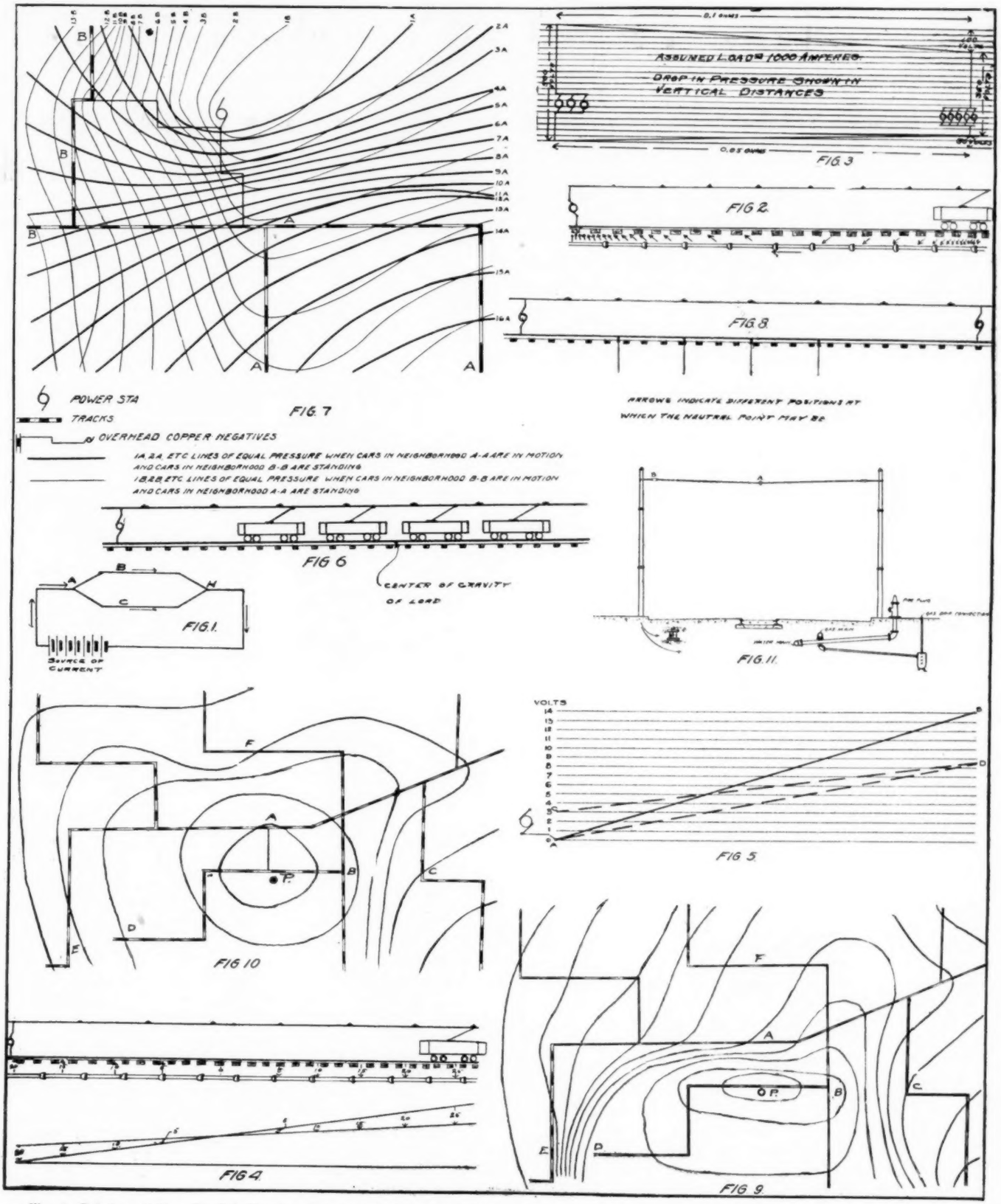

ASSUMED LOAD = 1000 AMPERES
DROP IN PRESSURE SHOWN IN VERTICAL DISTANCES
FIG 3
FIG 2
FIG 8
POWER STA
TRACKS
OVERHEAD COPPER NEGATIVES
FIG 7
ARROWS INDICATE DIFFERENT POSITIONS AT WHICH THE NEUTRAL POINT MAY BE
1A, 2A, ETC LINES OF EQUAL PRESSURE WHEN CARS IN NEIGHBORHOOD A-A ARE IN MOTION AND CARS IN NEIGHBORHOOD B-B ARE STANDING
1B, 2B, ETC LINES OF EQUAL PRESSURE WHEN CARS IN NEIGHBORHOOD B-B ARE IN MOTION AND CARS IN NEIGHBORHOOD A-A ARE STANDING
FIG 6
CENTER OF GRAVITY OF LOAD
FIG 1.
SOURCE OF CURRENT
FIG 11.
VOLTS
FIG 5
FIG 10
FIG 4
FIG 9

Fig. 1, Relation of Two Parallel Circuits. Fig. 2, Relation Between Rail and Underground Structure. Fig. 3, Rail and Trolley Circuit. Fig. 4, Plotted Measurements Between Rail and Underground. Fig. 5, Drop in Pressure. Fig. 6, Center of Load. Fig. 7, Power Station Connected with Track at Two Points. Fig. 8, Rail System with Two Power Stations and Feeder. Fig. 9, Lines of Equal Pressure over Street Car System.

ground or in the pipe system. Where the current is flowing from the ground or pipe system to the rail, if the soil is moist, we must anticipate that there would be a continuous loss of metal from the corroding action of the current.

From the laws that we have given above, it is perfectly evident that where we have a metal structure in the ground and carrying a current, that all parallel metal structures will carry a certain amount of this current. One way that we can prevent corrosion by electrolysis is by connecting our cable with a metal strip connected with a point of lower pressure so that all of the current leaving the cable will flow through this metal bond and thus pass off without consequent corrosion.

Fig. 5 has a solid diagonal line which represents the drop of pressure in the rails. *C D* represents the drop in pressure in the parallel metal structures. *A D* represents the drop in pressure in this parallel metal structure when its end is connected to the rail at the power station.

You might deduce from the laws given above and infer from the diagram that the moment the parallel metal structure is connected with the rail at the power station the current in this parallel structure is increased in volume. This is a fact. If all cases were as simple as the one we have been considering, there would be but very little to our problem. We will see in the discussion which follows that there are many modifying elements which complicate this problem.

In Fig. 6 it will be seen that with all the cars in motion at the same velocity, that for one instant the center of gravity of the load is at the point shown by the arrow. Obviously, the relation between the cars is constantly changing and the center of gravity of the road is always shifting and therefore the point where the current is maximum in the underground structures as illustrated in Fig. 4 is continually shifting. This is further complicated by other circumstances.

In Fig. 7 I have shown a power station connected with a track system at two points, this connection being, we will suppose, with overhead copper. At a time when the center of gravity of the load is in the neighborhood represented by *AAA*, the fall in pressure in the system is as shown by the system of heavy wavy lines nearly parallel to the bottom of the sketch and which are lettered *1A*, *2A*, etc.

When the center of gravity is in the neighborhood of *BB*, the fall in pressure in the rail system is as shown by the faint lines which are more curved and which converge vertically between the power station and the upper letter *B*. These are lettered *1B*, *2B*, etc. A little study of this will make it clear that the shifting of the center of gravity of the load makes very striking differences in the amount of current flowing and the direction of flow in different parts of the return circuit.

One instant all the cars in the neighborhood *AAA* are in lively operation and the cars in neighborhood *BBB* are quiet. The center of gravity of the load is in neighborhood *AAA*—and a generous stream of electrical energy is flowing toward the power station and in that portion of the track between *A* and *B* current is flowing from *A* to *B*.

The next instant all the cars in neighborhood *AAA* stop to discharge or receive passengers and the cars in neighborhood *BBB* start. Conditions are thus completely changed in an instant. The center of gravity is in the neighborhood *BBB* and in that portion of the track between *A* and *B* current is flowing from *B* to *A*.

In this case it would be unsafe to connect our cable system or our structure of parallel underground pipe at either of the points where the overhead copper is connected to the track, because sometimes one of these points is several volts above the other in pressure, and at other times it is several points below, as shown by the two systems of lines. By counting from these different systems of lines we will see that when the center of gravity is in the neighborhood of *AAA* the left hand point of connection of track to the power station is three volts positive to the power station, while the point in the center of the sketch is ten volts positive to the power station. When the center of gravity is in the neighborhood of *BB*, counting from the other system of lines, the left hand connection is nine volts positive to the power station, while the connection in the center of the sketch is four volts positive to the power station.

Fig. 8 is a rail system with two power stations and a trolley feeder section receiving current from both power stations. These two power stations jointly feed the load. There is some neutral point between the power stations at which no current is flowing in the track. This neutral point will shift according to the location of the center of gravity of the load and according to the conductivity of the rail and trolley feeder system. If both systems are uniform throughout and the center of gravity of the load was half way between the two power stations, the neutral point would be half way between. If the center of gravity was close to one power station, the neutral point would be between the location of that center of gravity and the other power station. (It would be in that case at the center of gravity, if the condition were not influenced by the conductivity of the feeder system.)

Fig. 9 represents the lines of equal pressure over the territory of a simple street railway track system with the power station at *P*. The faint wavy lines indicate the variation in pressure in the different parts of the rail system referred to the power station. For instance, the pressure at *C* is seven volts positive to the power station and the same is true at *G;* while at *A*, the rail pressure is five volts positive to the power station. Between *A* and *P*, *B* and *C*, *D* and *E* there is a congestion of these lines of equal pressure.

It can plainly be seen that by making auxiliary connection of overhead copper between *A* and *P* matters will be equalized and this congestion of lines between *A* and *P* will cease to exist. This follows because in following its legitimate path, current has to go in a roundabout way to reach *P* and it has to go in a roundabout way from *E* to reach *P* and also from *C*.

Fig. 10 shows lines of equal pressure in the same system with the auxiliary overhead copper connection between *A* and *P* of the same conductivity as the rail system. The faint lines indicate the lines of equal pressure with this auxiliary connection in operation. The improvement is quite striking. By equalizing between *B* and *C*, *D* and *E* and *A* and *F* the condition would be still further improved.

I wish to locate all points on our system where the rail paths could be reinforced at a slight expense, because closing these gaps will be a very great benefit to us.

A little thought on this matter will enable you to learn the circumstances of this kind which it is desired to inventory. One instance of this kind which came under my observation was where two tracks crossed at different grades. One grade was at the bottom of a canyon and was carrying a small amount of current. The other

track was on a viaduct 150 feet above. The track at the bottom was about 4 volts from the power station; the track above was about 15 volts from the power station. The value of such a connection is plainly seen.

Mere voltmeter readings would seem insufficient data upon which to diagnose conditions. The corrosive effects of electrolysis are proportional to the volume of current flowing. We might have the underground structure 5 volts positive to the ground, but from which we would be able with a short thick copper wire and a connection to either the rail, the water pipe or a gas pipe to obtain only a very small current measurement. On the other hand, we might have a structure that was one-half volt positive to the ground, but from which we could obtain a reading of 10 amperes by connecting this structure through an ammeter to the water pipe. In the first case, the hazard would not be at all serious, and in the second case it would be very serious, though the voltmeter reading only would show that the second case was not nearly as serious as the first case.

By referring to Fig. 4 the rails at the right hand of the diagram are positive to the ground. If our structures are corroded by current leaving where such structures are positive to the ground, the rails must also be corroded by passage of current where the track is positive to the ground. You will observe points where the flanges and web of the rail are exposed and where they have been badly corroded. Such indications are very interesting and should be noted. At points remote from the power station, where the copper jumper wires or copper auxiliaries are buried in the earth without any protective covering, they will disappear rapidly from corrosion; even more rapidly than will our lead in the district near the power station. Where these structures pass over water pipes or conduits of other companies the action will be focused on the structure immediately over such conduits or pipes.

It is not good engineering to place bare copper in the ground without protective covering, and even though it is buried in concrete where it is positive to the ground, it will corrode rapidly. I have found buried copper wires that were entirely changed to green fragments of copper salt, while the entire investment in metal copper that was overhead and connected with the track through these buried pieces was idle, though apparently carrying its quota of current.

One of the railway companies ties the sheath of its positive feeder cables to the rails and to the copper negative feeder at all possible points. From Fig. 4 it will be seen that at points remote from the power station the sheath of the cables will be positive to the ground and that they will quickly suffer from the corrosion of the lead. We can expect that this will begin to take place very shortly and it will be interesting to note the resulting burn-outs and to learn just how they affect the system.

It is desirable to make a few statements about the overhead system of the street railway companies. Fig. 11 shows a sectional view of a trolley street with underground structures. *A* is an insulator which insulates the trolley wire from the span wire. *B* is a strain insulator or circuit breaker that provides an additional insulation between the span wire and the pole. In both of these fixtures, insulating quality is generally sacrificed to mechanical stability and they are frequently defective.

A number of years ago when we had many street routes, before erecting line wires or removing them, a test was made of the span wires to see which span wires had defective insulators connecting them with the trolley wires. If my recollection serves me correctly, it was found that one span wire out of about 50 was found to be alive; that is it had sufficient leakage from the trolley wire so that a man could get a severe shock by touching it. If the same proportion held good in the strain insulators, about one pole out of every 2,500 would be more or less charged. I think you will find that something like this is the case. When the pole is charged you can see from Fig. 11 how the current can leak off on to underground structures and on to the gas and water pipes which are at the right of Fig. 11.

At the present time, fortunately, the specifications under which the Chicago street railways are being rehabilitated, provide for an additional strain insulater so that there is insulation at three points between the trolley wire and the pole. On the lines that have been reconstructed since this ordinance was passed the danger of a hot pole is very remote, but on the old lines I believe it is about as cited above.

In passing over the street doing work of the kind you are doing, I have found that the policeman and small boys playing around have told me of poles that were charged. A pole that has been charged has evidence of corrosion at the base of the pole. These can be found where they exist by cleaning off the little fillet of dirt which generally exists right at the base of the pole and thus exposing the metal. It will make this matter a little clearer to you if I relate the circumstances connected with a hot pole on North Clark street, which happened more than ten years ago.

A report came to the office late on Saturday afternoon that one of our laborers got a shock from a fish wire that he was pulling in a duct. I telephoned to the responsible officer of the traction company that they had a hot pole in that neighborhood and that I was going out Sunday morning to look at it and that he could send a man along if he wanted to. He said that he would be very glad to send a man along, but that they always found a hot pole within a few hours after it had become charged, and that, furthermore, at that particular time, with the large amount of snow on the ground, that the snow would be melted for ten feet from the pole. The following forenoon I arrived at the location with two representatives of the traction company and we found three hot poles that were metallically connected by means of guy wires and that around each one of these poles the snow was melted clear to the middle of the street and all the way between the poles.

On that side of the street the ground was bare and dry, and on the other side it was covered with six inches of snow. We also found that this pole had been charged for some time, that all the boys in the neighborhood knew about it and that as far back as Thursday a horse had been knocked down. The trouble all came through a defective trolley wire insulator in conjunction with a defective span wire insulator.

The exercise of a little imagination will convince one that any measures that we might take to prevent electrolysis would be futile in the case of such an accident. In the instance cited above, the fish wires in the conduit were entirely destroyed. Fortunately, there were no cables in this conduit run at that time.

A hot pole is not the only way in which the owners of underground structures can suffer from faulty overhead construction. Feeder wires may be imperfectly in-

sulated; they may pass through trees without means of separation from the branches of these trees. In such instances a considerable amount of current would leak into the ground from them during the wet weather.

The ordinary weatherproof insulation is not reliable as insulation. It is put on the wires because it does not cost much and because the general public prefers to see it there. The real reliance is on the insulated fixture which supports this feeder wire from the crossarm. When the feeder wire makes contact with the crossarm the insulation is unreliable. In small towns and on small systems the patron is served through a tap from the trolley wire and the return connection is made by grounding on the water pipe. This is contrary to the Underwriters' Electric Code, and you should report such instances so that we may remedy them.

I believe if you scrutinize all elevated railway columns and all fixtures that are in sight that convey grounded current for the railways that you will find many places where such columns and fixtures are corroded. Fig. 11 also has some other features which I would like to recall. For measuring the current flow from the cable to ground the fire plug affords a connection to the water pipe and the gas drip connection affords a connection to the gas pipe.

Gas, as delivered from the gas works, contains an appreciable quantity of moisture. This condenses underground and the gas pipes are laid with a grade to drain this moisture into sumps about 600 or 800 feet apart. Each one of these sumps is provided with a receiving chamber and surface outlet, as shown, for pumping out. They can be found close to the curb with very little trouble. When snow is on the ground the policeman or the man who keeps the peanut stand can tell you where to find them. You will generally find the snow shoveled away from them, as the gas company pumps them out very frequently.

Instances of defective installation of power and light wiring systems on business and residence premises throw large amounts of current into the grounded structures. The ways in which this can happen and the ways in which the owner of cable and piping systems can suffer are many and varied.

Automatic Exchanges in England

The subject of automatic telephony has been attracting the attention of the British Post Office authorities, especially for the past year and a half. In their desire to become familiar with its working, members of the staff were dispatched to the United States where they could observe it in actual operation. Consequently in July, 1911, orders were given for the installation of two 500-line automatic exchanges as an experiment, hoping by this means to ascertain the relative cost of installation and operation and the efficiency of the two different systems under conditions as found in Great Britain.

Epsom was the place chosen for the installation of the Strowger system. The British Insulated and Helsby Cables, Ltd. took over the British rights for this system and organized the Automatic Telephone Manufacturing Company for its development in that country.

The selection of Epsom for the inauguration of the automatic system was due to the fact of its being one of the smaller exchanges in the Metropolitan exchange area having an extremely high percentage of local calls, being not less than 52 per cent, while in many of the larger exchanges in London it was as low as 15 or 20 per cent.

Caterham Valley was chosen as the location for the Lorimer system.

The two systems present some differences. Owing to the fact that certain parts of the Lorimer apparatus revolve constantly, being stopped in the proper position when the call originates, a power plant is necessary in the Lorimer exchange, while in the Strowger plant there is no movement until the actual calling current impulses are sent.

In the Lorimer system after setting up the number the complete call is signaled at once by pressing a button, while in the Strowger system the apparatus is set successively for the different figures composing the number, sending out separate impulses which actuate the step-by-step electromagnetic switches in the exchange.

The Epsom exchange was opened May 26, but the Caterham Valley exchange has been somewhat delayed owing to the inability of the contractors to supply the necessary equipment. The Epsom equipment is for 400 lines. The numbers consist of three figures and range from 200 upward. The local operating is entirely automatic while the trounk operating is only partially so.

Each subscriber is supplied with a map showing the location of the various exchanges in the Metropolitan area. This area is divided into three districts; namely, central or northern area, southeastern and southwestern.

Should the subscriber desire connection with the central or northern exchange, by calling up "15" he is connected automatically to a junction line to the city exchange and upon giving the desired number connection is made in the regular manner.

For the southeastern district connection is made in the same way at Croydon, the number called being 16, and for the southwestern district the number is 17 and the place Sutton.

Through this experiment the Post Office will be able to determine the adaptibility of the automatic system to the different telephone exchanges in the future as all arrangements have been worked out quite thoroughly.

Whether or not larger exchanges will be installed at Leeds, Brighton and Portsmouth will depend, in a great degree upon whether or not the manufacturers are able to supply the equipment promptly.

British National Telephone Wants $10,000,000

When the British government assumed ownership of the telephone system of the nation, the matter of compensation for the telephone companies was left to be adjusted at some future time. Now the National Telephone Company puts in a claim for $10,000,000 and the matter is to be passed upon by an arbitration court.

The amount at stake is the largest ever taken before a British tribunal of that kind.

Aside from the size of the claim, the feature of interest in the hearing is likely to be information concerning methods of management by the telephone monopoly, a matter in which the British public is interested deeply.

The Sale of Telephone Service

By J. M. Carroll *

WHEN, in 1877, Alexander Graham Bell made the telephone a commercial possibility, not one person, I daresay, had the nerve to prophesy that at the end of 35 years there would be in use in the United States as many as one million telephones.

It is pretty generally known that there are *now* over 8,000,000 telephones in use in the United States. At the close of 1907 the amount of telephone wire in use in the United States exceeded, by 8,000,000 miles, that in use in 1902. That is what has been done in the past. It is development of the highest magnitude; in fact, it is one of the commercial wonders of the world. No commercial enterprise ever launched has entered so thoroughly and intimately into the business and domestic affairs of this country. That this remarkable development is due largely to the splendid staff of plant engineers, whose achievements in perfecting Bell's invention have revolutionized the world, is hardly to be gainsaid, in fact they made the telephone, in its perfected state, its own best salesman. Contract men, or salesmen, were unnecessary in the early days; the problem then was production or, in telephone parlance, facilities, rather than distribution. In order to develop the business, it was first necessary to develop the "art," and our efficient system of today is an evidence that the plant engineers did their work well.

But the telephone has now become the most necessary utility on the desk of a business man. If he does business he must have a telephone. It is with him just a matter of which company to patronize, if there should be a dual system in his town. Showing the business man which system he needs, and educating the second class merchants up to that need, is the duty of the commercial department, therefore the problem before us at this time is distribution, rather than production, or facilities.

The sale of a commodity is naturally the most important function of the organization producing it, therefore upon the commercial department rests the greatest responsibility within the company. Under the old organization we had many and various duties. Indeed, the sale and development of service was of secondary importance. Practically all of the new business came in over the office counter. Unless the unusual happened and a contract agent was sent to town, the manager was always busy with material reports or traffic peak loads and occasionally counting money.

Our functional organization has changed all this. It specializes us, gives an object on which to concentrate our efforts and makes us capable of rendering a more efficient service to the patrons. In other words, a man's best efforts are possible in the line of work for which he has special aptitude.

The day of "luck" in business is past. The business getter does not wait for business to come over the office counter, but sets about in an intelligent way to make the business come to him. He knows that business does not come by chance or accident, but as the result of definite plans intelligently laid and carefully executed. Legitimate business success is the result of working in harmony with certain fundamental principles. Salesmanship is no longer looked upon as an inherent trait, but as a science that may be studied as other sciences, and an art that may be acquired the same as other arts.

The successful telephone salesman, therefore, is the man who can think, who can adapt himself to the conditions he meets, who has the ability to express faithfully his ideas of the advantages of a telephone and close the sale. We cannot be better judged than by the impression that our ideas make upon our fellow men. Personality bearing the trademark of reliability must back up original ideas clearly and forcibly expressed, before they will carry deciding conviction. Personality is over fifty per cent of the battle in any hard sale, it is the impression you make upon a prospect, the manner in which you approach him and discuss your business that wins or loses the contract.

Some men, I realize, are not favored with the "personal projection" ability, and still succeed in business, but these men are rare and as a general thing, should not be required to come in contact with the public in a business getting way. Their special aptitude is probably in another part of the organization. As an example of this, I once had a manager who, by the way, is no longer connected with us, whom I overheard talking very sharply by telephone to a person regarding a delayed installation. Upon my questioning him about the matter, he remarked, "Oh, that was old Blank; he's an old chronic and I don't care whether we get him or not." That manager forgot that the investment in the particular plant was not his and that probably somebody who did own the exchange, did care whether we got him or not. When I got around to see the gentleman, who was a prominent merchant with a telephone already in his business place, and had ordered one for his residence, he was quite angry and decided to cancel the order with us and place one with the opposition. Do you blame him? I didn't, I agreed with him and had his telephone placed next day.

To sell telephone service the company must not only give good and efficient service, but must stand well with the public; and this latter responsibility rests entirely with the manager. From my experience I would say that the manager's relation to the public is dependent upon the kind of community with which he has to deal. He must adapt his management to his particular people. The different communities might be classified as follows: Agricultural, industrial, commercial and educational. Each locality has its relative class of public and differs in its nature, condition and environment, to which the manager must adapt himself, becoming a part of it. He should take an active part in civic matters, show an interest and an enthusiasm in things local, and in so far as he makes himself known and popular, just that far does he popularize his company. With a backing such as this he can meet a man in his office, get his time and attention with nothing but naked business between them and get the business he is after. To get anything worth while you must go after it hard and grab—especially in the telephone business.

One of the most difficult things in selling telephone service, as in other lines, is the closing of the deal. Never

*Talk made before the Convention of Telephone Managers at San Antonio, Texas.

put off the signing of the contract a single hour longer than is necessary. When it becomes apparent that the contract cannot be taken, pave the way for another interview; don't give the prospect an opportunity to say, "I will call at your office when I am ready." The other fellow may get him first. At the second interview simply ignore all such statements as "I guess I will not do anything now," as the same argument that was effective before will be effective again if stated in another way. Never hesitate to state the same argument in different ways if you see it is effective.

I have been asked what the factors are that go to make up a man's personality, and I say adaptibility, enthusiasm, self-respect and sincerity.

I think that sincerity coupled with frankness if applied to the taking of all farmer line contracts would be of great benefit to both the plant and traffic departments. I mean by that, in the anxiety to close a farmer line contract we should not leave the impression with the farmer that the service will be up to the standard even if he attaches his wire to the barbed-wire fence. Be frank with him, tell him the truth, he will appreciate it and nine times out of ten he has the money and will build a decent line. On the other hand, if you are afraid that you will lose the business on account of the expense and tell him that the fence is all right as long as it is wire, he will become dissatisfied with the service in a short time and tell everybody he knows and probably kill off several prospects. If he thinks the cost high refer him to the manufacturer and at the same time refer the manufacturer to him. Then he will get the "dope" in every mail.

Everybody needs telephone service if for nothing more than to get the correct time of day. Every farmer *should* have a telephone even if cost were double what it is. I never could understand just why a telephone is not the first thing a man would think of upon taking up his residence on a farm. The question with the non-telephoned city residence is generally one of cost, and that is where ability as a salesman comes in. If the price suited everybody you would simply be an "ordertaker." It is the ability to talk quality and sell in the face of cut prices that distinguishes the salesman.

Talk quality and show the prospect where your service is valuable and actually necessary for his particular condition. A careful survey of the premises in which he happens to be will suggest the argument; these usually vary in different places, hence the necessity for being quick to grasp an opportunity and drive home the argument.

In selling telephone service, as in anything else, always endeavor to sell your best grade. The reasons for this are obvious. Also watch the subscriber's needs and endeavor to sell him a second and third order, in the way of extension sets, p. b. x. equipment, etc.; he will appreciate it and become a booster for you.

Another very important point I wish to bring out is the retaining of present subscribers. Every order to discontinue should have the manager's personal attention at all exchanges, except perhaps the largest ones, and an effort made to have the subscriber retain the service. If this is done we have pleased the subscriber by showing our appreciation of his business, escaped the disconnection expense, and, as compared with a new subscriber, the heavy installation expense.

I believe, as I have said, that enthusiasm is one of the greatest factors making a good salesman, but I wish to add a word of caution in this respect to the younger managers and contract men. Some there are who become so enthused when they make a sale that they make rash promises of immediate installation, surprising the subscriber with "this afternoon or tomorrow." That is wrong. It is better to surprise the subscriber with the real thing than with a promise, much better, especially if the promise slips up. All of the smaller exchanges have regular installation days. Keep in touch with the plant department and you will always be in a position to tell the subscriber just about when he may expect the installation. The plant department appreciates just as much as you do the importance of and the necessity for prompt delivery; its whole organization has been planned and designed with the predominant idea of prompt efficiency.

New Telephone System for Mexican City

Consul Samuel E. Magill, Guadalajara, Mexico, reports that the Mexican Telephone & Telegraph Company, an American-owned concern with headquarters in Mexico City, has been granted a concession by the city of Guadalajara to put in an entirely new telephone system and give the city a service modern and up to date at a cost of about $250,000 gold, with wires underground throughout the city.

While there are two telephone companies now serving Guadalajara, the service of each is insufficient and the operators inefficient, so that the business interests of the second city of Mexico will welcome a good service.

The representative of the company claims work will commence at once and that the system will be in operation in about one and one-half years, also that, as American capital controls the company, American methods, apparatus, and material will be used wherever possible. He further claims that the company also plans to connect Vera Cruz on the east coast with Manzanillo on the west, thus giving long-distance telephone service between the connecting cities, which include some of the most important in the republic—Orizaba, Puebla, Mexico City, Queretaro, Celaya, Guanajuato, and Guadalajara.

Appeal in Physical Connection Case

Suit was started in the Thurston county (Washington) superior court June 4 by the Benton County Independent Telephone Company and the Pacific Telephone & Telegraph Company, appealing from the ruling of the Public Service Commission ordering a physical connection between the Benton County Company and the Sunnyside Telephone Company at Grandview, Outlook and Sunnyside. The action asks that the superior court grant a writ of review of the public service commission's ruling, and pending such review the superior court enjoins the commission from enforcing its order. The long distance physical connection was ordered to be made within thirty days after the order was entered, May 3.

The Benton county company is allied with the Bell system and has, so it claims, an agreement with the Pacific Telephone & Telegraph Company whereby the physical connection was precluded. This case is of considerable interest, as the order directing physical connection was the first of its kind ever made by the commission.

The Telephone Scrap Book

DOLLAR SCRAPS.

"Scraps" suitable for this department will be paid for at the rate of one dollar each. Each scrap must have at least one illustration, for which a rough pencil sketch will suffice. Practical kinks for workers are most desired, although any original matter that is really interesting is acceptable. A kodak snap-shot with a few words of explanation may be just as satisfactory to the editors as a long article. Unused scraps will be returned, and the used ones will be paid for after publication.

Locating Opens in Aerial Wires

NOTABLE improvement in the transmission of speech has been accomplished by the application of the loading coil invention, which largely increased the field of telephonic intercommunication and, of course, the amount of business. The phantom and composite principles have been applied, and improved traffic methods have been worked out with a view of utilizing the present plant to its fullest capacity. All of these improvements have considerably increased the value of the toll circuits, and call for a corresponding advancement in trouble prevention, says T. L. Davidson, Cleveland, Ohio.

Every precaution is taken by long-distance telephone and telegraph companies to prevent circuit trouble and in case they do occur to locate and clear

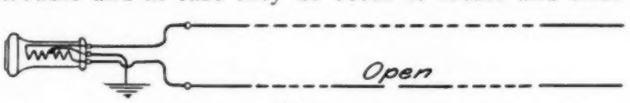


Fig. 1.

them quickly. For this purpose test stations are usually located at the intersection of leads and are equipped with apparatus for locating crosses, grounds, opens, etc. Besides this provision linemen are stationed at comparatively frequent intervals between these testing points to assist in locating troubles and hasten their clearing.

The results of trouble testing work which depend on the resistance or continuity of a circuit are favorable as compared with those relying on their capacity. Generally speaking, the use of the capacity test has been successful in connection with locating troubles in cable, but complex and mystifying problems present themselves when endeavoring to apply it to open aerial circuits. This difficulty is due to the fluctuation in the insulation resistance, to inductive and magnetic disturbances, and the low capacity per unit length as can be seen from the following comparative statement of the electrical characteristics of open wire and cable:

	Cable.	Open wire.
Loop Resistance per mi.	88.00	10.500
Mutual Capacity per mi.	.07	.008
Inductance per mi.	.001	.004
Insulation Resistance, in megohms, per mi.	500.+	1. to 100

In Fig. 1 is shown a "split-head" telephone method for locating opens. The center of the receiver winding is grounded and the terminals are connected to the circuit in trouble. The wires should be free of condenser capacity. The tester estimates the length of the open wire by the character and volume of the sound produced by the unbalanced condition. This method seems rather vague in its character, yet fairly close locations are made by experienced testboard men.

Dr. Thompson's fall of potential method modified as shown in Fig. 2 has been successfully used on circuits having a uniform electrical make-up, free of

Fig. 2.

lumped inductance and rather highly insulated. The test set consists of an induction coil, the secondary terminals of which are connected to the pair in trouble and the center is grounded through a sensitive relay. Alternating current of about a 60-cycle frequency is applied to the primary winding, and the induced current is superimposed on the weak surging current commonly known as "line noise." The core is moved forward by means of the tangent screw *B* until the relay *R* starts to vibrate, and then backward until the relay again starts to vibrate. The mean reading indicated by the pointer *A* is taken as the true balance.

In case the circuit under test is subjected to inductive disturbance from the power circuit applied to the primary winding of the coiler, the phase relation of the induced currents may interfere so as to introduce errors. This would be especially true if the open is near the office doing the testing.

The arrangement shown in Fig. 3 is a modification of the Wheatstone bridge method and has been devised by the writer. Relay *A* is used as a pole changing relay and thereby charges and discharges the line. Relay *B* biases the galvanometer or low reading voltmeter across the bridge and operates in unison with the pole changing relay. This method is very sensitive in showing the balance, is independent of any surging current caused by foreign distributing wires, and indicates the fluctuation in capacity so that the

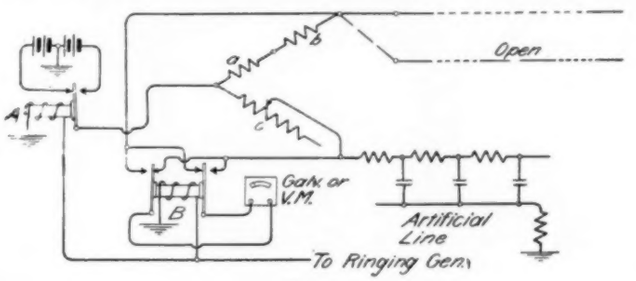


Fig. 3.

tester can approximate the location of the open. On account of the comparatively slow operation it is very little affected by the inductance of loading coils.

In testing for an open care should be taken that the wires are free of any condenser capacity, and if they are in contact with other wires, cable or anything which would add to their capacity, the results will be

unfavorable. The bridge should be connected to the good wire and the artificial line, and the resistance c and the line should be adjusted until c is as nearly equal to $a\ b$ as possible. The same balance should be made when connected to the open wire. Then,

$$A_2c_2/L_2 = A_1c_1/L_1, \text{ or } L_2 = L_1\frac{A_2c_2}{A_1c_1}$$

Where L_1 = length in miles of the good wire.
L_2 = length in miles of the open wire.
A_1 = miles of artificial line in first test.
A_2 = miles of artificial line in second test.
c_1 = resistance in variable in first test.
c_2 = resistance in variable in second test.

To check the results of the above test the good wire should be looped back to the open wire at the distance office, or a direct comparison should be made by omitting the artificial line and connecting the bridge to the pair. In which case the formula becomes: $L_2 = L_1\ (a + b/c)$.

The Corrosion of Iron and Steel

WHILE steel has greater tensile strength, greater rigidity, and is cheaper to produce in large quantities than wrought or "puddled" iron, it is far more susceptible to the corroding influences of moisture, coal gas, smoke fumes, or sea water. Besides its weakness in the last mentioned respect, steel is also greatly influenced by electrolytic action, or by intermittent currents of electricity in spite of its greater hardness and density. It should be understood that in this article we refer only to the common grades of carbon steel, produced by the Bessemer and open-hearth processes and not to the recent alloys, any of which are far superior to iron in their corrosion-resisting properties.

Relative effects of corrosion on iron and steel have long been noticed on sheet metal and terne plate roofs, where the life of steel is only a small fraction of that

Fig. 1. Iron and Steel Eye Bolts.

of iron, especially when subjected to sulphur-laden gases from burning coal. A common explanation of this phenomena that is current among steel men is that the slag which always exists in wrought iron forms a protective coating around the iron, shielding it from the effects of moisture, while steel, lacking this silicious coat, is attacked immediately.

In a pamphlet issued by the United States Department of Agriculture, Dr. A. S. Cushman, the author, arrives at the following conclusion in addition to the one just named:

That the presence of, and the irregular distribution of manganese in steel, there being little if any of this substance in iron, causes the disintegration of the steel through electroyltic action set up by the minute local currents maintained by the difference of contact potential between the two metals. In addition to the manganese, current flow also results from the various metalloids

Since the conditions which produce electrolytic

Fig. 2. Iron and Steel Wire.

action also produce corrosion, the purer the iron the greater the homogeneity of the iron, and the less the segregation of metalloids, the less likely are the electrolytic effects to become serious. These points constitute the essential problems which confront the manufacturer who desires a metal that will have a high resistance to corrosion.

In order to produce a steel that would approach puddled iron in its resistance to corrosion, the American Rolling Mill Company of Middletown, Ohio, began experiments to determine whether a steel could be produced in an open-hearth furnace that would be free from carbon, manganese and impurities of a like sort that are instrumental in producing electrolytic action. This led to burning out even more carbon than was common in the ordinary process of manufacturing steel, and was an elimination process, pure and simple, as no elements were afterward added either in the furnace or in the ladle. The iron thus produced was of more than ordinary purity, which was afterwards cast into ingots and rolled.

The analysis of this new process iron, in comparison with commercial steel, averaged as follows:

	Commercial steel	American ingot iron
Sulphur	0.048	0.020
Phosphorus	0.086	0.006
Carbon	0.110	0.026
Manganese	0.480	Trace
Silicon	Trace	Trace

It should be borne in mind that these determinations were made from fractions of the same original ingot, and consequently the results show the complete elimination of two elements that existed in the original source.

After the analyses, corrosion tests were made of the two samples, which consisted of an immersion in a 5 per cent solution of sulphuric acid for twenty-four days. The loss of weight was as follows:

Loss in weight, commercial steel	14.41 per cent
Loss in weight, ingot iron	0.21 per cent

This shows that the loss in the case of the commercial steel was very nearly 70 times that of the ingot iron in the same time, and under equal conditions. The ultimate strength of the ingot iron was from 49,000 to 51,000 pounds per square inch; elastic limit, from 35,000 to 41,000 pounds per square inch, and elongation from 40 to 48 per cent.

The two illustrations accompanying this article show the comparative rates of solution of steel or char-

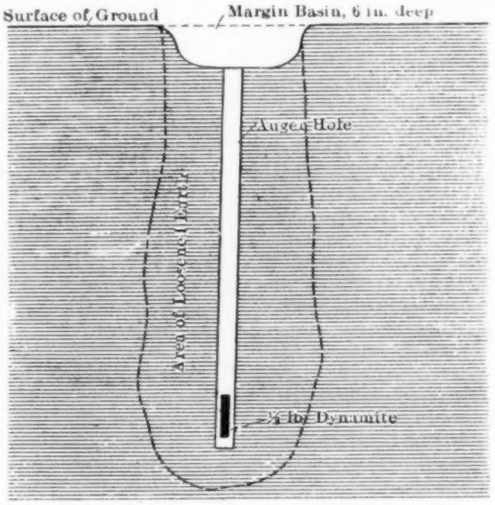
coal iron and ingot iron after immersion in a 25 per cent solution of sulphuric acid. The eye-bolts in Fig. 1 were treated in the bath for six hours, one being of charcoal iron and the other ingot iron. At the end of this time the ingot iron bolt showed a loss of 15.5 per cent, and the charcoal iron bolt a loss of 77.3 per cent.

In Fig. 2 is shown two specimens of wire, of ingot and steel respectively. The difference in rate of solution was even greater in the case of the wire than with the eye-bolts, as the ingot iron wire lost but 6.1 per cent in one and one-half hours, and the steel wire 92.3 per cent in the same length of time.

Digging Pole Holes with Dynamite

EXPERIMENTS made by the Marion (Ind.) central-station company with the use of dynamite for opening pole holes in frozen ground indicate, says the *Electrical World* that the explosive reduces the excavation cost from $1.75 to about 35 cents per pole, besides enabling one gang to dig sixteen to eighteen holes—about a mile of line—a day.

In preparing for the dynamite a little basin 6 inches deep and the size of the hole is first opened at



Section Through Dynamited Pole Hole.

the surface of the ground to prevent the explosive action from spreading. Then with an auger a 2-inch hole is bored to the desired depth of the excavation, and into this hole is dropped a half-pound stick of dynamite, about 16 cents' worth. The resulting explosion shatters the ground about the auger hole, loosening the frozen earth at the surface up to the margin of the basin first cut. This loosened earth in the hole can then be "spooned" out as easily as any uncompacted material and the hole is ready for the pole. In making preliminary tests in frozen ground at Marion it was necessary to set off two half-pound charges at different depths for each pole, but with unfrozen ground only one 16-cent charge is likely to be required. Further tests are now being made at Marion on excavating with dynamite, and these will be reported later. This labor-saving application of the explosive seems to be a new one.

Carnegie said: "To secure promotion, a young man must do something unusual, and especially must this be beyond the strict boundary of his duties."

Portable Insulation Tester

THE accompanying figures illustrate, diagrammatically, the working of a new insulation tester specially designed for workshop and portable use in cases where expediency and convenience are more important than extreme accuracy of results, says *Electricity*.

The instrument enables the determination of insula-

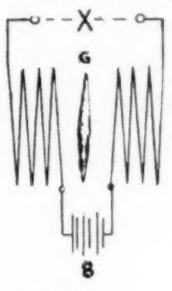


Fig. 1.

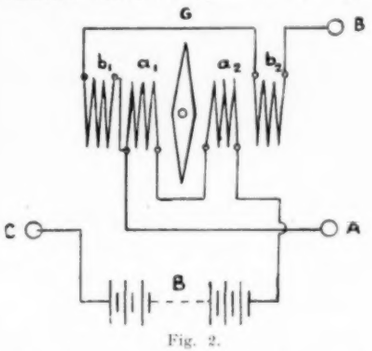


Fig. 2.

tion resistances, the location of faults and the testing of connections. It is essentially a galvanoscope, and as such is subject to well known limitations and conditions of use. The instrument is affected by neighboring masses of iron and by stray fields; the setting must be such that the needle lies over the zero of the scale before commencing each test; the scale is calibrated in degrees, a table of equivalent external resistances being attached. Dry batteries are used and should be renewed at frequent intervals in order to maintain the accuracy of the original calibration.

The small portable galvanoscope (Fig. 1) comprises a single set of field coils, a four-cell dry battery and the test terminals to which the unknown resistance is connected. The range of this instrument is from 20,000 ohms to 1 megohm. A similarly arranged instrument for pocket transport is operated by three batteries and has a range from 10,000 to 500,000 ohms.

Fig. 2 represents an instrument of wider range but identical principle. For the lower sensibility, ter-

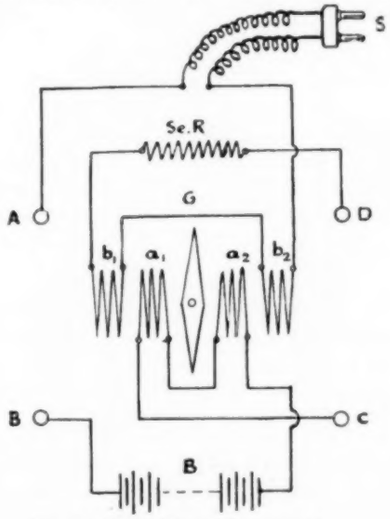


Fig. 3. Single Range Galvanoscope.

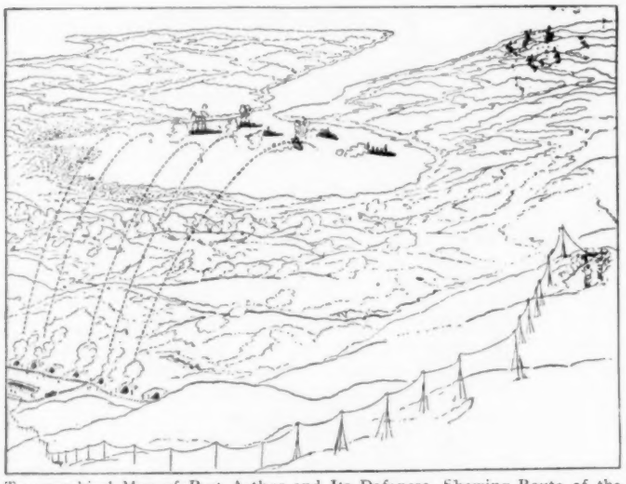
minals *A*, *C*, are employed, while for higher delicacy terminals, *B*, *C*, place all four field coils in series. A battery of 6, 12 or 24 cells is used. Instruments of this type are built for ranges from one, two or four

thousand ohms to one-half, one or two megohms respectively.

It is often desirable to test insulation resistances under the full working voltage which they will ultimately sustain. Fig. 3 represents a single range galvanoscope arranged to enable the determination of resistances connected between *B*, *C* at the battery voltage or of resistances connected between *A*, *D* at the working voltage (obtained from the supply mains by the plug *St*). Instruments of this type are made for voltages up to 250 v.; 10,000 ohms is the lowest resistance which can be measured under 110 volts test pressure; the highest value determinable is 50 times the chosen minimum, up to a maximum of 5 megohms.

Costliest Telephone Line Ever Built

THE costliest mile of telephone line ever erected is the temporary line which the Japanese army experts constructed from the foot to the top of 203-Meter Hill, just outside of Port Arthur, during the siege in the Russo-Japanese war, relates *Popular Mechanics*. It might also be asserted that few lines represented the expenditure of so much energy, resourcefulness and courage, to say nothing of human life, or were used for so short a space of time with such tremendous results.



Topographical Map of Port Arthur and Its Defenses, Showing Route of the Costliest Mile of Telephone Line Ever Constructed. Big Japanese Guns Lower Left-Hand Corner and Telephone Station at Right; Russia's Fleet in the Distance.

Early in the siege of Port Arthur the Japanese, finding field guns wholly inadequate to reach the town and harbor, set up half a dozen or more great 10-inch guns, "Osaka babies" they called them. These were placed as near as possible to the main defenses of the town which were located along a semicircular chain of hills, surrounding the harbor. The guns were some four or five miles distant from their main objective, the town and fleet. Between them and their targets interposed this chain of hills, tall and almost impregnable. Hence, using the guns was purely guesswork, something like throwing a stone at a man on the other side of a house. The gunners could not get the slightest idea as to where their shells struck.

Far over to the Japanese right, near the end of the Russian hill forts, was the loftiest point in the district, 203-Meter Hill. From its summit one could look squarely down into the town and harbor of Port Arthur. It was strongly protected by fortifications and also flanked by other Russian forts.

To gain possession of the summit of that hill General Nogi addressed all his skill and force. Its sloping sides were lined with intrenchments protecting thousands of Russian riflemen, while from either side the neighboring forts could pour shot and shell into any attacking force. For a few days the Japanese assaults were simply slaughters. At length Nogi obtained a foothold at the base, and slowly, day by day and by night as well, he worked his way up while 30,000 Russians and hundreds of guns poured their fire into him. Finally he gained the summit, built a small bomb-proof and left there—two men and a telephone!

That was all, but it was all he needed. Thousands of Japanese soldiers protected these two from Russian attacks, which continued ceaselessly, for those two men with the telephone could do more harm than all the rest of the Japanese army. Their telephone line ran down the hill and, thence, to the great "Osaka babies." At a signal from the man at the phone, great shells were flung over the hills toward Port Arthur. The men on the hill watched their landing through field glasses; then they telephoned that gun No. 1 had struck too far right or left of some battleship or arsenal. Thus corrected, the next shots dropped closer; the telephone man again corrected the gunner. And so, through that single wire, the man at the phone directed the fire of the great guns until the Russian fleet, batteries, and arsenals, powerless against such an enemy, were abandoned.

The fate of Port Arthur was decided by the man at the phone. But it had cost dearly. What the Russian loss was is not exactly known, but the Japanese lost 10,000 killed and wounded, expended hundreds of thousands of rounds of ammunition, besides the time and energy of a great army for a period of more than a fortnight, in running that last mile of wire to the top of the hill. It is therefore safe to say that the cost of no other mile of wire ever even approached such a tremendous sum. But, from the Japanese point of view, it was worth it.

Austrian Service to Be Improved

The reform of the Vienna telephone service, it is stated, will be accomplished within the next ten years. It was originally intended to introduce the full automatic system, but the engineer department of the Post and Telegraph Administration gave its decision in favor of the semi-automatic system. Ten semi-automatic exchanges, for 10,000 subscribers each, will be established. Three of these exchanges will be built first. Under the stimulation of the orders placed in connection with these operations, Austrian electrical manufacturing firms are experiencing a period of unwonted prosperity, and several are enlarging their works. Among the latter are the Ericsson Austrian Electrical Manufacturing Company and the Telephonfabriks-Aktiengesellschaft, both of which are making extensive additions to their works. In addition to the orders already placed, commissions for some 20,000 instruments of various kinds are in sight, besides large orders for telephone cable for the projected lines to Triest and Dalmatia, rendered possible by the 20,000,000 kronen credit for postal purposes included in this year's state budget.

Practical Joint Pole Construction

By J. E. Macdonald *

THE Los Angeles method of joint pole construction has been proven by five years of practice to be a workable scheme. Independent operation, accompanied by very rapid development and expansion, permitted pole conditions to become extremely objectionable to the public as well as to the corporations responsible for them; and this reached a critical stage in 1906, when agitation for underground subways for all public utilities marked the beginning of the present co-operative policy. Distribution by the underground method, except in the business district, is impracticable, for the reason that the populated districts demanding service are scattered over a very wide range of territory, there being entire absence of congestion anywhere.

The principal companies took up the problem of joint pole construction, and the result was a general agreement covering the different phases of the work as seemed best fitted for local conditions. These conditions were favorable for the consummation of the project. The old construction stood out boldly as an object lesson in dangerous and unsightly congestion. The undeveloped but rapidly growing districts offered a field for trying the proposition under favorable conditions without any complications. There were some problems in the older districts which were not so readily solved, chief of these being difficulty of eliminating the capital charges against the existing overhead system of each operating company. It is evident that if any poles are removed before the expiration of their natural life, or if wires are transferred which are providing adequate service, then a certain portion of the original investment must be absorbed in some manner in reconstructing on joint poles. This factor was given proper consideration in the preliminary investigations made in arriving at a satisfactory working agreement. A policy was adopted making the participation in such joint construction entirely optional with each company. However, when any poles are set, it is always with a view to providing space for all parties operating in such location. Even with this liberal policy, there have been but few cases where all companies have not found it to their advantage and profit to immediately join in such construction. Notwithstanding this condition, there has been no unequal division of the financial responsibilities, neither has there been any reason to suspect that the joint work has helped the financing of one project at the expense of another.

The working agreement executed by nine companies operating in common territory assigned the executive powers to a committee, acting without compensation. This committee is comprised of one representative from each member company, all representatives having similar authority regardless of the pole plant owned by the company represented. A secretary, appointed by the committee, is actively in charge of the details of the combination work. An office is maintained independently of the affiliated companies, the expense being prorated uniformly against these member companies. The committee meets monthly for the discussion of combination work, and the consideration of mutual problems. The secretary is advised of all contemplated construction and reconstruction, and plans are made accordingly to provide for the service of all companies operating in the section where proposed construction or reconstruction is to be undertaken. The agreement makes certain fundamental stipulations; it defines the general purpose and intention of the agreement; it places certain necessary restrictions on joint work, defining the limits of good practice; it specifies the method of operating under the agreement; the term of agreement and responsibility of each company is predetermined as far as practicable; it limits the manner of occupying and space to be occupied by each party; it fixes valuations and charges, and prescribes regulations governing special expenses and maintenance. In addition to the foregoing fundamentals, certain general regulations, which should not be considered as arbitrary rulings, have been adopted.

1. Combined Use of Existing Poles. In the combination use of existing poles, the combining parties use the highest or most satisfactory poles in the location where it is desired to make the combination. The owner of same is permitted to bill the combining parties for a proportional interest at the rate which has been fixed for the valuation of such poles.

2. Reconstruction by Owning Parties. When it is desired to reconstruct a pole line in location where none of the existing poles are suitable for combination use, one of the parties operating in this location sets new poles of standard size and length sufficient for the combination use of all parties operating in this section and for any other party which may desire to obtain space on poles. The constructing or owning party then sells a proportional interest to each party making the combination at the rate which has been fixed for the valuation of such poles. Each party transfers its wires and removes its poles at its own expense.

3. Reconstruction by New Coming Party. When the party is occupying a favorable location on any street or highway, and a second party desires to build a pole line in the same location, if the construction of the first party is entirely satisfactory and adequate for present and future needs, that party is not obliged to assume an expense in connection with the joint occupation of the new pole line built by the second party. The latter builds pole line suitable for combination use of both parties, and grants and assigns an interest in same to the first party without charge, except that the first party transfers its wires, cross arms and fixtures at its own expense from old poles to new poles. This party removes its poles at its own expense and they remain its individual property. In special cases, however, the second party may be required to pay the entire expense incident to such transfer of wires and removal of poles, and this is determined by the committee, only those participating

*Abstract of a paper read before the Portland meeting of the A. I. E. E., April 16-20.

in the decision who are directly interested in the combination.

4. New Pole Lines in Undeveloped Territory. Any party desiring to construct a new pole line in location where heretofore no pole line has existed, notifies the other members, through the committee, of the proposed construction, and upon request provides space on such poles for the use of all parties who express their intention of combining in their use. The constructing party is then permitted to bill each of the combining parties for a proportional interest at the rate which has been fixed for the valuation of such poles.

5. Renewing Poles Naturally Decayed. All poles which have been in use as long as the committee determines that they are safe or satisfactory, or as long as the parties owning shares in same desire to use them, are replaced by new poles. The work of constructing such new pole line is undertaken by one of the parties, as determined by the committee, and this party is permitted to bill the other parties in the same manner as specified heretofore.

6. Disposition of Joint Property Removed from Service. Joint poles removed from service may be removed at joint expense to a place designated by the committee, where they may be sold at auction, due notice having been given to each party prior to date of sale. The proceeds of the sale are divided between the owners in proportion to the number of shares owned by each. More frequently it is desirable that such poles should be sold or disposed of before being removed, the purchaser removing same at his own expense. This may be done by mutual agreement or by an exact division of the property in proportion to the shares owned by each party.

7. Use of Old Poles. In the combination use of poles, those which have previously been in service elsewhere may be used, and provided that such poles are in other respects equal to new poles, are valued at the same right as for new poles of the same height except for that portion which has been in the ground, which is considered as of no value.

8. Records. A record map is prepared for all combinations. Poles are numbered to correspond with house numbers of adjacent property. These maps are supplements to the general agreement and furnish a complete record, specifying the number and size of poles, date when set, valuation, and such other data as may be desirable in each case. These supplements must be approved by all parties interested before any authorization for billing is permitted. A complete file of all combination work is maintained for each company by the committee.

9. Specifications. A specification is understood to imply only first class construction, and as a rule, deals with maximum and minimum quantities. Assuming therefore, that each party is maintaining its lines in the highest state of efficiency, a joint specification is simply a summation of all specifications together with such modifications as are necessary to mutually protect the property of combining parties. This subject is so extensive that it cannot well be covered in a paper of this scope. The author would refer those seeking enlightenment along this line to the specifications adopted by the New York Telephone Company and the Public Service Corporation. This offers an excellent standard of construction, which is worthy of adoption. Local conditions will not demand any radical changes therefrom.

Digest of Foreign Telephone Literature

Translated for Our Readers

THE SCHLOEMILCH THREE PART ELECTROLYTIC DIRECTOR.

THE Telefunken system of wireless telegraphy and telephony has recently introduced a new electrolytic detector which is a distinct improvement. Since the new detector retains the old principle of the electrolytic cell and the general arrangement, it is only necessary to call attention to the new features of this design.

The detector in its older form had two disadvantages. First, the apparatus became useless after a comparatively short time, since the platinum electrodes wore off with long service. All that could be done after this happened was to take the entire apparatus apart and rebuild it, necessitating its removal to the factory. The second objection lay in the fact that the detector was permeable and allowed the acid to leak out when the detector was turned wrong side up, which was not always avoidable in transportation. The new detectors eliminate these two disadvantages entirely. The detector consists of three Schloemilch cells, which are arranged in a star-shaped order. This arrangement permits the acid which fills only one-third of the glass receptacle to flow into one of the three points only. The three points of the detector are therefore set at an angle of 120 degrees. If one of the cells stands perpendicularly, the acid from the other cells must flow into this one deepest point, since the other cells are tilted at such an angle that the acid flows out by force of gravity. The advantage of this arrangement is that a simple rotation of the cells can always bring an auxiliary cell into play in case one of the three cells should refuse to work. To differentiate between the three points, they are marked by Roman numerals. The change from one point to another can be made without interruption of service. The second drawback of permeability to the acid is eliminated by having the three points melted airtight into the glass tubes, so that a leakage of acid is out of the question. Platinum wire is used for conductors since this wire has the same expansion coefficient as glass and expands and contracts equally with the glass, preventing the glass from bursting through unequal expansion of the wires.

The glass receptacle carries two metal caps, which are used as electric conductors to the electrodes and as bearings for the cells. By means of these ball-shaped caps the detector is set into a fork-shaped spring support, which in its turn rests on a hard rubber plate. The latter has the same shape and dimension as the old style detectors and can therefore be used in any telegraph or telephone system. The operation of the new detector is as

simple as that of the older one. All that is needed is to take care that the detector has the right polarity when the glass receptacle is set into the metal fork and when the detector is placed into the receiving apparatus. The electrode (anode) set into one glass point must be connected to the positive pole of the battery, and the other electrode passing into the electrolyte (cathode) must be connected to the negative pole of the battery. A changing of the poles is not possible, since the glass vessels are constructed in such a way that they only fit properly when connected with the proper holes. One of the two ball bearings (metal caps) has a small point and the other an indentation, and the fork shaped seat has a similar arrangement so that mistakes are out of the question. Tests made with these new type detectors have given very satisfactory results and proved them to be very much superior to older types.—*Jahrbuch f. draghtlose Telegr. u. Teleph.*

NEW WIRELESS TELEPHONE APPARATUS.

The Telefunken system of wireless telegraphy and telephony gives a description of a new apparatus which is used in the telephone service to increase the strength of weak currents of a certain number of periods. The principal elements of the apparatus are three cells arranged star-shaped from a central point of suspension. A small armature which can be made to vibrate up to 1,000 vibrations per second is arranged between two steel wires under tensions, whose tensions govern the vibrations of the armature. In front of the armature is an electromagnet. This vibrating armature is supplied at one electrode with a small carbon grain microphone; the opposite electrode of the latter is stationary. If the armature of the system is moved into oscillations or vibrations by the electric currents passing through the electromagnet, the microphone experiences changes in resistance. The current circuit of the latter undergoes changes of current of greater intensity than those of the primary impulses, although of the same frequency. The increase in current strength is therefore due to an increase in the microphone effect.

If two small carbons (e. g., arc light carbons) are laid crosswise without fastening them together in any way, and if the carbons are placed in circuit with telephone and two dry cell batteries, a microphone contact resistance will take place where the two carbons are in contact. This resistance is very unstable, however, and changes at the least mechanical disturbance or even changes of sound in the telephone. The current passing through the resistance is therefore either strengthened or weakened in the same degree as the influence which acts upon the two crossed carbons.

In practice microphones are used in which fine carbon-grain dust is employed, since this reacts quicker and better on any mechanical or sound disturbances than the carbon pencils. With proper construction of the microphone, and employment of the laws of resonance, weak currents can be strengthened to a remarkable degree. One of these microphones would not be powerful enough, however, and so they usually use them in series of three and four, in which each one increases the current received from the preceding one. The last microphone has usually a loud speaking, specially constructed telephone attached, whose diaphragm is set into such strong vibrations by the strong current that the sounds can be heard plainly throughout the room where the instruments are used. Aside from this use it is possible to fix these acoustic signals on a Morse telewriter. For this purpose the sounds are transferred from the loud speaking telephone to a transformer, which transforms the direct current sent out by the microphone circuit of the last apparatus. The secondary coil of the transformer carries no current, as long as the current "boosters" do not operate. When they work, the secondary coils will contain alternating currents, which are changed to direct current by the detector, and which can now bring the polarized relay into action. The local contact of the relay is connected to the battery and to the Morse machine. Parallel to the relay spools is a capacity of 2 m. f. which is to counteract the self induction effect of the relay. The entire apparatus consists therefore of the vibrating, pendulum-like armature described before; the telewriter apparatus; the wooden supports for the two instruments and the suspension device for the swinging armature; the loud speaking telephone and the battery for strengthening the sounds in the apparatus.

The boosters are three in number and are attached to a starshaped castiron central support, which is suspended so as to be safe against excessive vibrations. The boosters themselves are protected by sound and waterproof casings. On the covers of these casings are rotating annular magnets, through whose magnetic field the booster system is increased and the sensitiveness of regulation is greatly improved. The poles of the telephone magnet-coils end in the two lower fork-shaped contact pieces of the system, while the wires from the microphones are connected to the two upper hook-formed contact pieces. To protect the microphone against injury in transportation, it is switched off by an automatic double pole switch, which is operated by an electromagnet within the cardan suspension of the booster system. When following the path of the current from the terminals to the transmitter-receiver switch and to the d.c. wires, the electric lamp above the booster is short circuited. The electromagnet will therefore attract its armature when the full current strength is thrown in, and will open the switch. If this is done, the electric lamp will be thrown into the eelctromagnetic circuit automatically, and the main current will be weakened so that the magnet winding will not suffer through excessive heating, even though it be thrown in for hours at a stretch.

The telewriter consists of the Morse apparatus and a plate containing the relay, the double pole switch, the detector, and various terminals.

The current coming from the instruments can be sent either into the telewriter or into the loud speaking telephone. If the switch is set for the "receiver," the microphone currents are sent direct into the telephone. One advantage of this system is that the currents can be switched into both the Morse apparatus and the telephone, allowing a control of the written signs by the use of the telephone. If the boosting of the telephone current should not be enough even with the instruments used, a 1000 ohm telephone can be used to control the sounds received. This telephone can also be used along with the regular loud speaking telephone receiver, wiring the two in parallel.

The loud speaking telephone is of the 25 ohm type, whose diaphragm can be changed in its relation to the magnets so as to get the maximum or minimum of sound. An acoustic resonator may be placed in front of the

instrument to increase the strength of sound. Great care must be taken in regulating the diaphragm distance, as otherwise the latter will not give satisfactory results, and will lose in length of service.

The storage battery for the boosting of incoming currents consists of three single storage battery cells of four volts each. These batteries can be placed in a common box, and wired in series, so that the voltage at the charging terminal is twelve volts.

The instruments are especially useful on board ship and have been built so as to stand the vibrations and motion of a ship running in a heavy sea without any trouble. If the instruments are used in torpedo boats, which are especially exposed to excessive vibrations, and if the tones received through the telephone receiver are obscured in clearness by overtones or other sounds, increased resistances switched into the microphone circuit will eliminate this trouble. The elimination of these external disturbances decreases the sensitiveness of the apparatus, and care must be taken to remove the resistances as soon as the noises have subsided.—*Jahrb. f. Drahtl. Telegr. u. Teleph.*

TREATMENT OF POLES FOR TELEPHONE LINES.

Among the older methods of preserving wooden poles against the destructive influences of the atmosphere and moisture is the method invented by the Englishman Cyan, consisting in impregnating the poles with a solution of chloride of mercury, a corrosive sublimate; the Boucherie process which displaces the sap of the poles and fills the pores with copper sulphate; the processes in which the poles are closed up in cylinders under pressure, forcing the metallic salt solutions or tar oil into the fibres of the poles. There are other methods in which the poles are simply dried or burned to remove the moisture, not using any preservative, but these processes are old and have no important bearing on present practice. The cyanising method, in which the poles are immersed in a 66 per cent solution of corrosive sublimate and kept there for ten days, has given fairly satisfactory results, although even here the preservative process does not go very deep, leaving the underlying layers of wood still open to destructive influences. The Boucherie method was the one used most extensively by German and French telephone and telegraph companies, since it gave the best results. Here the poles are impregnated with a copper sulphate solution, which is forced into the fibres of the wood under great pressure, displacing the sap in the fibres and replacing it by the copper sulphate solution. The effect goes much deeper since the sulphate fills all the pores of the tree down to the very center. Since the introduction of the tar oil preservative, the German telephone companies have used this latter process instead of the Boucherie method, as the results are about the same, if not better, and the cost much lower. At first the tar oil was used undiluted, and the poles were saturated with the solution. This became a source of great expense, however, since it is only within recent years that the tar oil was produced in large quantities as a by-product of gas works, and thus went down in price. Government officials made tests with diluted tar oil, using light carbohydrates, like benzole, benzine, etc., with the tar oil. Then it was tried to recover some of the preservative solution by drying the poles in a high temperature. But the results were not satisfactory, for the liquid recovered was in many cases unfit for further use, or else so small in quantity that the recovery process cost more than the value of the product recovered. In addition it was found that the high temperatures used in the process injured the strength and life of the pole, so that this had to be abandoned. In 1910 the "Rüping" process was used extensively, and this process seems to have come to stay, as it is very cheap, using tar oil, which is forced into the poles at a great pressure, and gives good life to the poles. This process was described in TELEPHONE ENGINEER. Last year the Prussian government tried out poles impregnated with solutions of naphthalene-zinc sulphate and silicon-sodium fluoride. Poles preserved with these salts have the advantage of greater resistance against moisture, since the above salts are not readily soluble in water, so that rain would have little effect on the preservative. The other salts are easily soluble in water and long exposure to rain and moisture is liable to draw most of the preservative solutions out of the poles and leave it open to destructive influences.

The mineral oils have no value for the wood preservation industry since they possess no antiseptic qualities. The best results seems to be those in which anthracite coal tar oil is used, which can be produced in enormous quantities and very cheaply as a by-product of gas works. The usefulness of tar oils for preservative treatment lies in the great antiseptic power of the oil in fighting off fungi, bacteria and growths; in the fact that the tar oil once pressed into the cells of the wood cannot be removed by moisture or ordinary atmospheric agents; in the fact that the tar oil enters into no chemical combination with any of the constituents of the earth. The preservative quality of the tar oil is chiefly due to the neutral constituents of the tar, which have a very high boiling point and are very hard to evaporate. Even small quantities of this preservative are sufficient for efficient protection, and it was determined that quantities of four pounds per cubic foot are sufficient to give the pole a nine-fold factor of safety. This has reference to the Rüping process mentioned before. In relation to this process it may be interesting to note that the German testing station at Charlottenburg has found that poles impregnated according to this method increase their strength by 15 per cent. In addition it was noticed that poles preserved in this way offer a great resistance to water, which is a very important fact for telephone and telegraph poles in winter, when the wood usually has the least resistance, due to the influence of snow and frost. Moisture followed by frost reduces the elastic strength of poles by about one-half, and it is just at this season that they need their greatest resistance in order to stand the winter storms.

Last year a new process was successfully tried by two Hungarian engineers, Haltenberger & Berdenich, which deserves careful note. They found that pine poles could not be impregnated down to the center rings, due to the structure of the wood fibres, which is more in the longitudinal direction and less in a direction converging at the center. It was tried in several patented processes to perforate the wood and thus force the preservative into the cells, but the results, while satisfactory from this standpoint, were a failure from the point of view of strength, as the poles lost over half of their resistance to mechanical influences. Investigations proved that this loss in strength was due to a displacement of the fibres. The two engineers mentioned conceived the idea of loosening the fibres without, however, displacing them, and constructed a machine which bored holes of about one inch depth and 0.08 inch diameter into the poles, the latter always moving in a radial direction. The holes are bored

or rather pricked by rapidly revolving nails. After this is done the poles are impregnated by the Rüping process. In this way it is possible to use wood which otherwise could not be employed for poles as the build of the fibres is such as to allow no application of preservatives. The poles need only be bored down to a certain length, say the section in the ground, and the rest can be impregnated without this preliminary treatment.

To give a good idea of the relative life of telephone poles the statistics gathered by the German Post and Telegraph authorities may be considered as standard. These statistics cover a period of fifty years.

Treatment of Poles	Life of poles, years	Cost per lin. ft. per year
Copper sulphate method (Boucherie)	11.7	$0.35
Zinc chloride method	11.9	.34
Mercury chloride (Cyan)	13.7	.32
Tar oil	20.6	.25
Poles not treated	...	.49

The above shows what progress has been made in the preservative treatment of poles, thus offering a good argument against the displacement of wooden poles by iron and reinforced concrete poles. The latter especially have been favored considerably within recent years, but it remains to be seen whether they will compete with the long life promised to wooden poles treated by the recent methods of preservation.—*Elektrotech. Zeit.*

MEASURING ALTERNATING CURRENTS IN TELEPHONE LINES.

The author, Professor Abraham, calls attention to the importance of measuring alternating currents in telephone lines. Among the sources of current used in modern a. c. practice he mentions the Villard alternator, which is used in wireless telegraphy also, and generates current up to 500-1000 periods. The Siemens high frequency generator and the Mercadier-Magunna electric tuning forks are also mentioned. To determine the effective resistance, self induction and capacity standard resistances may be used. If the Wheatstone bridge is employed, great care must be taken to have the a. c. passing over the arms of the bridge of the same tension and phase. He advocates the telephone as a good agent for measurement when using the Wheatstone bridge, mainly on account of its great sensitiveness, since it can detect currents of 1/100 of a microampere. There is some difficulty, however, in training the ear to note the disappearance of the fundamental tones. The harmonic oscillations or overtones, which accompany all alternating currents, are clearly audible in the telephone, and hinder the accuracy of measurement. This disadvantage can be eliminated by using the Abrahams telephone, which can be regulated so as to shut out the overtones and leave the fundamentals clearly audible. The diaphragm is supported by two wires, which can be placed under greater or lower tensions corresponding to the number of vibrations to which the receiver is to respond. The telephone will therefore respond to any number of vibrations to which it has been set, depending on the tension of the wires between which the diaphragm is stretched. If the instrument is set for the fundamentals of a. c. no sound is audible in the zero position. Another method to eliminate the overtones is to place a self induction into the current circuit, or else to place a capacity in parallel with the circuit. Since the parallel wired capacity can pass the a. c. the easier, the higher the frequency, the result is that the overtones will take their path over the capacity. In other methods of measurement the Duddell thermo-galvanometer is used, as also the reflecting galvanometer, which allows the measurement of current down to 0.01 milliampere. The Chauvin and Arnoux measuring instruments are less sensitive. All of the above instruments measure the average capacity of the current passing through them, independent of their frequency. Consequently they measure both the fundamentals and the overtones, and the current influenced by external causes, thus giving really a very inaccurate means of measurement. The electrodynamic instruments are much more accurate and sensitive, best among them being the modified d'Arsonval-Deprez galvanometer, which measures currents down to 10^{-9} ampere. Currents having periods above 1000 cannot be measured by any instrument now in existence. The Alder measuring instrument approaches this limit, but is not very accurate at this high frequency. There is therefore great need of some sensitive measuring instrument which will measure a. c. above 1000 pueriods.—*Annales des Postes, Telegr. Teleph.*

NEW KRARUP CABLES FOR ITALY.

The Italian government has recently installed 20 miles of telephone submarine cable, using the Krarup system of winding for increased self induction. The copper conductors are surrounded by coils of iron wire. The copper cables have two large conductors, each of which consists of seven strands of thin copper wire (1/32 inch), twisted into one cable, and encircled by a coil of soft annealed iron wire (1/64 inch). Pure gutta percha is used for insulation, three layers for each conductor. The copper wires are insulated by a special woven jute fibre insulation. The cable is laid in lengths of 1,000 feet each. The cables have the following standards electrically, tested at 15° C:

Copper resistance with direct current	11.745	ohms
Copper resistance with alternating current 1,000 periods	12.546	ohms
Mutual capacity with d. c.	0.0894	microfarad
Self-induction measured with a. c. of 1,000 periods	5.872	millihenry

This gives the cable a specfic damping effect of B=0.024 per km. (0.6 mile) of double conductor. Since this same cable without the iron coil would have a damping coefficient of 0.057, we have a decrease in this respect of 58 per cent, which means doubling the efficiency of the cable. This is all the more gratifying, since the English Post Office engineers claimed that the iron wire coils would increase the efficiency of the cable by only 60 per cent.—*Annales Postes, Telegr. Teleph.*

Ohio Commission News

In an opinion rendered by Attorney-General Hogan, at the request of City Solicitor O. H. Stewart of Middleport, Ohio, regarding the rights of cities owning public utility plants to undersell privately owned plants, when possible, it is held that municipalities enter the business under the same conditions as private individuals or corporations and have the same rights regarding rates, except that the same shall not be below the cost of production.

O. P. Gothlin, chairman of the Commission, is said to be considering plans for the combination of the Bell and Independent telephone companies, thus furnishing a single service and expresses the belief that no undue increase of rates will ensue.

Preparations are being made to equip all Danish passenger steamships and ferries in service between Sweden and Germany with wireless telephones, for which operators are not needed. There will be twenty receiving stations along the coasts of the three countries.

Nebraska Commission News

The Lincoln Telephone and Telegraph Company, after a conference with the Nebraska Railway Comrate where two exchanges have existed and have been consolidated as a result of the merger of the company's interests with the Bell telephone interests in the greater portion of the South Platte region. The company at first proposed to retain the higher rate in force and discontinue the lower rate, but the commission insisted on the lower rate being used until the matter of rates for the merger have been adjusted.

Under this agreement, the commission has issued an order permitting the company to reduce the long distance rates from Steinauer to Burchard, Pawnee City, Table Rock and Tecumseh from 15 cents to 10 cents.

The company is also ordered to reduce its long distance rates from Lincoln to Firth from 20 cents to 10 cents.

There being a demand in Lincoln from private branch exchanges for the service of both the automatic and Bell service the Lincoln company has applied for and received permission to make a rate of $6 a month where trunks are used to both the manual and automatic exchanges. The rate of $6 will be in lieu of a charge of $8. It is understood that this is only temporary, or until the two systems are consolidated in Lincoln.

The Nebraska Telephone Company is authorized to publish new rates at Fullerton effective with the installation of a common battery exchange and to file the rates with the commission at that time.

New York Commission News

Charges that the New York Telephone and Western Union Telegraph companies had combined to divert business intended for the Postal Telegraph Company were heard by the New York Public Service Commission, second district, June 4. Both parties were given until July 1 to file briefs.

The question came up before the commission on an informal complaint made by Superintendent Kimmey of the Postal Telegraph Company, charging that the New York Telephone Company is by illegal discrimination diverting to the Western Union telegrams intended for the Postal and that it is the practice of the telephone company to connect telephone subscribers desiring to send telegrams with a Western Union office even when the name of the Western Union is not mentioned by the subscriber. He insisted that the telephone company makes every effort to send telegrams to the Western Union even though subscribers endeavor to get connection with a Postal office. It was further pointed out at the hearing on Superintendent Kimmey's complaint today that where a person sends a telegram to the Western Union from a pay station he is charged nothing for the telephone service, whereas if he sends the telegram to a Postal office from the same station he is charged the regular telephone toll rate in addition to the full telegraph rate.

Officials of the Postal insist that the New York Telephone Company, as a public service corporation, has no right to extend these favors to the Western Union to the detriment of the Postal, and they requested the commission to forbid the telephone company from connecting a telephone subscriber with a Western Union office unless the subscriber specifically asks for "Western Union Telegram." It was brought out that when this practice came in vogue last year the Western Union had telephone subscribers use "Western Union Telegram" for their telephone calls and later on had their telephone call cut down to one word "Telegram."

The Postal officials told the commissioners they would be willing to have both of the telegraph companies go back to the telephone numbers, but insisted that if this was not done, the Western Union telephone calls should be changed from "Telegram" to "Western Union Telegram," in which event the Postal call would be "Postal Telegram."

The commission has made an order requiring the New York Telephone Company to reduce its rates so that subscribers living in the town of Elmira in the district known as West Elmira shall be charged the same rate for telephone service as is charged in the local area in the city of Elmira. The telephone exchange is situated about 2¼ miles south of the northerly line of the city and 1⅜ miles east from the westerly boundary of the city. The hamlet of West Elmira is a distance of about two miles from the telephone exchange, which is less than the distance from the northerly line of the city to the telephone exchange; but the company has been making an additional mileage charge which fixed the rates to be paid by West Elmira subscribers at $12 a year more than the rate charged within the city limits.

The commission finds that the mileage charge made is unjust, unreasonable and unjustly discriminatory and that the just and reasonable charges are those now charged for like service within the territorial limits of the city of Elmira.

The company is required to put the new rates into effect July 1.

Ohio Syndicate to Control Interstate

Negotiations are under way by receivers and creditors of the Interstate Telephone and Telegraph Company of Joliet and Aurora, Ill., for control of that company's holdings by an Ohio telephone syndicate backed by the Ohio Trust and Savings Bank of Toledo, according to F. A. Dolph of Aurora, receiver for the Interstate company.

On July 5 or several days later the new company should assume charge, and according to Mr. Dolph, will better the service, and prepare to pay off the indebtedness of the company. A Mr. Griffis, of Louisville, Ky., is expected in Aurora this month to take charge, and will become general manager of the Interstate company, with offices in Aurora.

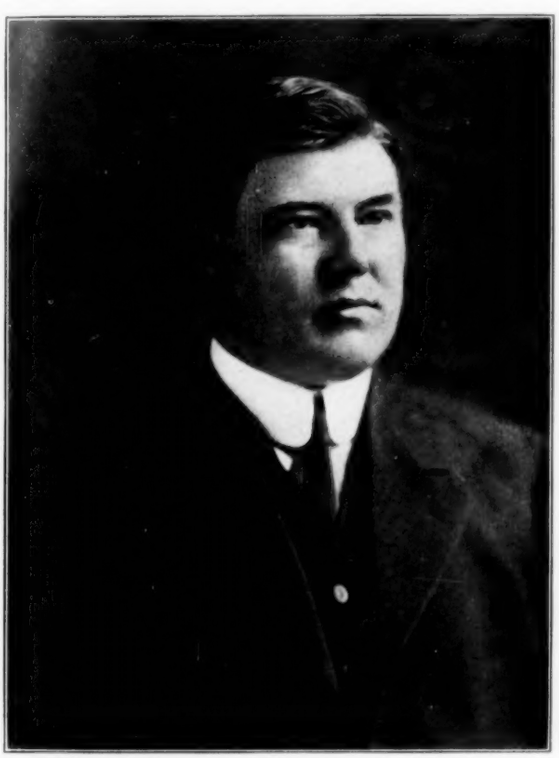
The syndicate which is bidding for the independent company is now operating the Home Telephone Company, of Louisville, where Mr. Griffis is assistant manager. No changes are expected in the management of the Joliet andAurora offices, according to Mr. Dolph.

Rumors prevalent that the Bell telephone interests, of which the Chicago Telephone Company is a part, are behind the Ohio syndicate which offered to take over the Inter-State Telephone Company, however, has aroused suspicion among directors and stockholders of the latter company and the deal may not go through.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

PRESUMING that the world do move; that our civilization conforms to higher altitudes; that our speech has been buffed and burnished and our clothes refined to the galling point; there are still some pit falls and snags for the best of us. Ordinarily we approach a man with a cheery, top of the morning smile and a pocket filled with two-for-a-quarter. The skirmish for his attention has not been standardized. We indulge in idle conversation and swap yarns—providing the house pays the bills and the object of our affection isn't too busy. There are many ways to get to a man. Salesmen regard these secrets as personal assets. No one has ever been able to figure out a plan of approach that will nail every victim. Should you ever have need to get a hurry-up audience with G. W. Lorimer, he of Piqua, Ohio, take a gun. It doesn't matter what sort of a gun you take, but don't forget. Pull it on him in a gentlemanly way and caress its machinery end, being careful the while how you point it and how you refer to it. No matter whether it is the newest model or an antiquated relic; a toy pistol or a 10-inch disappearing coast defense; the mere sight of it wins G. W. Lorimer's undivided attention, his heart and as much time as he can spare. From which it may be deduced that G. W. is a gun fan. He is. Ten to one he will take you by the arm and lead you into his arsenal and show you the original of your selection, artistically arranged alongside the inventor's first model and the tools and dies used in its manufacture. He will then escort you to his shop and show you a set of targets with symetrical perforations in the proximity of the bulls-eye, explaining that your particular gun will do more efficient work on a cloudy March day after three o'clock in the afternoon than at any other time. Should you care to stick around, he would give you the actual demonstration for proof. Without stopping for breath, he would also deal out, off hand, the effect its discharge would have upon all things terrestrial and celestial, contemplating amunition and previous servitude conditions. The Lorimer gun collection is real, and it is immense. It is the chief one of his various collectors' exhibits and goes to emphasize that Mr. Lorimer commercializes his hobbies, making them a business as well as a pleasure.



There Isn't a Trace of Genius in His Appearance.

George Will Lorimer has his home in Piqua, Ohio. He is thirty-eight years old and comes under the head of telephone engineer because of his years of activity with the automatic telephone system which bears his name. These patents were filed early in 1900 and telephone men know much concerning the system and its history since then. The original invention was taken in the name of George W. and James H. Lorimer. James H. Lorimer died November 6, 1901. Strangely enough, the town that gave birth to the Bell telephone, gave us George Lorimer and the Lorimer automatic telephone system, which would make Brantford, Ontario, the real center of the telephonic universe. Which recalls an incident worth repeating.

Mr. and Mrs. George Lorimer and their family have had occasion to reside in Washington in the shadow of the Patent Office—inventor's have found it necessary to do this, both as an expedient and an economy. Samuel G. McMeen was in town one day and the program included a ride in the rubberneck wagon. McMeen knew that Alexander Graham Bell's residence came in for part of the megaphone spiel and to play a joke on G. W., he fixed it with the front-seat horn man to say, "and on the rear seat of this car is George Will Lorimer, also of Brantford, inventor of the automatic telephone." In order to prevent any mistake, McMeen took one of his cards and wrote Lorimer's name on the back of it. The program was running along in fine shape; Mrs. Lorimer had been tipped off and excitement was high—when the announcement was made in strict accordance with the plans and provisions—except McMeen's name was used. The printed side of the card was the only thing that caught the eye of the meg. artist!

They tell lots of stories about George Lorimer. He grew up in his father's factory and had access to the machines and tools. When he was twelve he had built a steam engine that would work successfully. His public schooling was at St. George, and he got high school at Scotland, Ontario. In addition to the

English course, he also had what was called the science course. He was at work in telephony in 1892.

George Lorimer gets a lot of joy out of living. He has that rare faculty of not taking himself or his work seriously. There isn't a trace of genius in his appearance. You would never imagine that he has bumped around on both sides of the Atlantic, rubbing elbows with all sorts of people. You would be surprised to learn that he loves his old shop at Piqua, next best to his home and family. He is the most ordinary of the big-hearted, unostentatious sort who make this country great. You have never seen his picture before, because he doesn't want publicity. He has had a lot of it, goodness knows, because the courts have had their inning in automatic patent causes and it has been expensive to teach the complexities of automatic telephony to the jurist. This publicity will be found on the book shelves of patent attorney's libraries where common folks never look.

Interference from Power Lines in Iowa

A case where an operator of an electric light and power system at Glenwood, Ia., has been enjoined from continuing to transmit current over construction which does not conform to specifications authorized by recognized electrical authorities as tending to minimize interference with adjacent telephonic lines, is related by *Public Service Regulation.*

An unofficial statement of facts, coming from a reliable authority, sets forth that defendant built a line passing under, over, around and parallel to the wires of Iowa Telephone Company, and transmitted over this circuit electrical current at 6,600 volts pressure. The telephone company protested to him, before and during construction, and furnished him copies of the American Institute of Electrical Engineers' specifications covering such construction.

On failure of the owner of the high-tension line to take proper precautions, and demonstrations of actual injury and risk to the service, property, employes and patrons of the telephone company, the matter was taken into the District Court of Mills County, Glenwood, Ia.

A "consent decree" was obtained setting forth construction in accordance with the telephone company's specifications based on recognized good practice, which the defendant agreed to follow, and the court gave him 30 days to complete work.

An abstract of some of the more essential points of the decree follows:

In the District Court of Iowa in and for Mills County. Mills County Telephone Co. and Iowa Telephone Co., Plaintiffs, vs. Central Station Engineering Co., Joseph A. Bortenlanger, Anton J. Bortenlanger, Defendants.

Now, therefore, it is hereby found, ordered, adjudged and decreed by the court as follows:

First—That the plaintiffs are prior lawful occupants of the highways in the city of Glenwood, in the towns of Mineola and Silver City and of Mills County, intervening between said city and towns, and are entitled to use and enjoy their telephone lines in said highways free from substantial interference by and danger from high-tension electric light and power lines erected by the defendants.

Defendant was ordered, among other things, to remove a transformer, relocate guys on several poles, provide double cross-arms and fasten high-tension wires thereto, erect new poles at specified points; at one place the defendant was required to remove the telephone line to the opposite side of the road and properly reinstall it under supervision of the agent of plaintiffs, who should, however, bear the cost of such supervision.

At all crossings or intersections of high-tension and telephone lines, defendant was required to reconstruct the high-tension lines to provide an eight-foot vertical clearance, to cross, uniformly above telephone lines, and provide numerous other safety features in accordance with standards accepted by electrical engineers of recognized standing, all being duly set forth in the decree.

Should the defendants fail to comply with the provisions of this decree, after the expiration of the time limit, they are enjoined from transmitting any high-tension current whatsover over their line until it shall have been reconstructed to conform to the decree.

Electrical Instruments in England

American tourists have long wondered at the popularity of the tumbler switch for turning on and off the lights in rooms of English hotels. That Englishmen visiting America have assumed the same attitude toward our push-button switches is asserted in a monograph on English electrical instruments just issued by the Bureau of Manufactures at Washington, as a result of investigations by H. B. Brooks, commercial agent of the Department of Commerce and Labor. The relative merits of the two systems is discussed in the pamphlet, and several arguments in favor of the American device are put forward.

In the same bulletin it is stated that English girls have failed to give satisfaction at such work as winding coils and calibrating instruments. The English manufacturer is of the opinion that the girls do well at light routine work, but are content to go on year after year performing the same tasks. For example, a girl may be taught to calibrate 100-ampere ammeters and will do well on a lot of these, but if she is to do such instruments one day, and another sort the next, and so on, she requires too much superintendence.

In one of the largest electrical works in England the time limit system is used in the testing room. Thus, if eight hours is the alloted time for a particular piece of work and a man does it in six, he is paid for one of the hours saved and the firm saves the other. In this shop the average instrument maker earns sixteen to eighteen cents an hour, while some of the highest class men make twenty to twenty-four cents. The works of seven of the leading electrical firms in England are dealt with in the same publication.

"Telephone Herald" in Philadelphia

Another trial of the plan for news distribution by telephone will be made in Philadelphia by a company which has been organized for the purpose. It is proposed to charge $1.50 a month to subscribers, who will be supplied with news through the day on a regular schedule, and with musical entertainments in the evening.

The local telephone company operating at Teneriffe, Canary Islands, which is Swedish, is considering the installation of a new and modern system. The present line runs from Teneriffe to Laguna and Tacaronte, with about 300 subscribers on the books in Teneriffe and 100 in Laguna.

Dielectrics at Telephonic Frequencies

By J. A. Fleming and G. B. Dyke *

PART I.—THEORETICAL.

CAREFUL research has already been made upon the energy losses in dielectrics when acted upon by alternating electric force. This paper deals only with the power factor and conductance of dielectrics under alternating E. M. F. of low voltage, pure sine wave-form and of frequencies between 900 and 5,000 p. p. s., as this has a close connection with practical telephony. The energy loss at high voltages and low frequency (700 to 20,000 volts and 50 to 100 p. p. s.) has been studied by B. Monasch, and quite recently by E. H. Rayner. It has long been known that the conductivity of certain dielectrics for alternating currents of telephonic frequency is much greater than for direct or unidirectional currents, and the principal object of our work was to examine this alternating conductance (denoted by S) and the capacity C, as well as the ratio S/C (denoted by s) for condensers and cables made with various dielectrics and tested at different temperatures and frequencies within the range of telephonic work.

If a condenser or cable of capacity C has a simple harmonic alternating E. M. F. of maximum value V and frequency $n=p/2\pi$ applied to it, it creates a dielectric current CpV, nearly in quadrature with the impressed voltage, and also there is, or may be, a power absorption proportional, as shown by all experiments, to the square of the impressed voltage. This indicates that there is a current, SV, in step with the voltage. Hence, the power factor of the condenser is given by the expression $s/\sqrt{p^2+s^2}$; but for small power factors is sufficiently nearly expressed by s/p or by S/Cp.

It can easily be shown that for a loaded telephone cable operated with alternating currents of frequency $p/2\pi$ having conductor resistance R, conductor reactance Lp, dielectric leakance S and dielectric admittance Cp, if R/Lp and S/Cp are small quantities, the attenuation constant a is approximatey given by the expression,

$$a=\left(\frac{r+s}{2}\right)\sqrt{CL},$$

where r represents R/L.

In the case of oscillations of a condenser having dielectric conductance S connected in series with an inductive circuit having resistance R, it can also be proved that the frequency of the oscillations is given by the formula

$$n=\frac{1}{2\pi}\sqrt{\frac{1}{CL}-\left(\frac{r-s}{2}\right)^2},$$

where C is the condenser capacity and L the inductance of the circuit, and r and s denote the ratios R/L and S/C. The damping factor for the circuit is $\frac{r+s}{2}l$, and the decrement per period of the oscillations is $(r+s)/2n$. These quantities r and s are of the dimensions of the reciprocal of a time, and s, moreover, is independent of the geometrical form of the condenser or cable dielectric, and is a specific constant for the material such that $S/C=4\pi\sigma/k$, where σ denotes specific conductivity and k the dielectric constant, provided that we may assume the dielectric conductivity obeys Ohm's law.

In the experimental part of this paper it will be shown that when employing alternating currents the effective dielectric conductance S is a function of the frequency, and is much greater than the steady current conductance measured in the ordinary way. The reason for this must be that there are then additional sources of internal dissipation of energy in the dielectric. One conclusion which is evident, both from the experiments recorded in this paper and from those of previous workers, is that any moisture present in the dielectric immensely increases this alternating-current dielectric loss. But, apart from this, it appears that the energy loss can be divided into two parts. One part which results from a conductivity independent of the frequency which is possibly electrolytic in nature, and another part which results from a conductivity very nearly proportional to the frequency, at least within the limits of voltage employed in the experiments here described, which possibly may be connected with a dielectric energy loss analogous to that which we call the hysteretic loss in iron under alternating magnetization. It is this total alternating-current conductivity and its ratio to the capacity which especially concerns us in the case of cables and condensers used in telephony.

It is curious that cable manufacturers continue to pay such great attention to the so-called insulation resistance (I. R.) measured by applying a steady or direct-current voltage to the cable and then stating the I. R. as so many megohms per mile after one minute's electrification. Except as a rough test of dielectric strength and means of revealing defects of manufacture the above measurement has very little, if any, scientific value.

In the case of insulated cables to be used with alternating voltage, and especially high-frequency voltage, such as telephone cables, the quantities which have real significance are the alternating-current conductivity S for a stated temperature and frequency, the ratio $S/C=s$, and the ratio $S/Cp=s/p$ (which when small is nearly the power factor), and the quantity usually called the admittance $\sqrt{S^2+C^2p^2}$. In all these expressions, when they occur in formulae concerned with telephonic transmission and high-frequency currents, the symbol S is *not* to be taken as equivalent to the reciprocal of the insulation resistance measured with direct currents, nor is C the steady or direct-current capacity, but they are quantities only to be obtained by special measurements.

The two quantities with which we are concerned in this paper—viz., the capacity and dielectric con-

*Abstract of a paper read before the Institution of Electrical Engineers, London.

ductance of condensers or cables for simple harmonic currents—may be numerically defined respectively as the number by which the mean square voltage or mean square terminal potential difference (*P. D.*) must be multiplied to give the maximum energy storage in each half period; and as the number by which the same quantity must be multiplied to give the mean power absorption in the dielectric.

Assuming we have a condenser constructed with such a dielectric as gutta-percha, we find that when a steady constant *E. M. F.* is applied to it there is at first a current into the condenser which rises very quickly to a maximum value and then dies gradually away or decreases to a constant minimum. In the same manner on discharge a large current comes out for a short time and then tails away rapidly, but a small current continues to come out for a long time. This process is generally referred to as the *absorption* of the dielectric, although the term is very misleading. In a so-called perfect or non-absorptive condenser the charge and discharge would be completed in an infinitely short time. It is sometimes stated that we can imitate the behavior of any condenser as regards its mode of charge and discharge due to absorption by substituting for it a perfect condenser having a certain resistance placed in series with it. This is made the foundation of certain bridge methods for comparing capacities. The statement is, however, true only within certain limitations.

Experiment shows that the charge and discharge current of a condenser formed with most solid dielectrics does not obey a simple exponential law. The measurement of the dielectric constant of dielectrics corresponding to various times of charging, made, for instance, by the method used by Prof. Thornton,* shows that the charge taken up by a condenser under constant E. M. F. first rises very suddenly, then increases more slowly, almost in accordance with a straight line law, and then finally approaches asymptotically a limiting value. Of these three stages, the second stage, or slow increase according to a linear time function, is called the absorption. A curve of this kind can be imitated almost exactly, as far as regards the first two stages, by superimposing a curve represented by an equation of the form $y=Y(1-\epsilon^{-Ax})$ on a straight line $y=mx+C$. Hence we may say that the charge q in a condenser at any time t, not very long after applying a constant E. M. F., is given very nearly by an expression of the form

$$q=Q_1(1-\epsilon^{-A_1 t})+Q_2(1+A_2 t),$$

or if $A_2 t$ is a small quantity, by

$$q=Q_1(1-\epsilon^{-A_1 t})+Q_2(1-\epsilon^{-A_2 t}),$$

where Q_1+Q_2 is equal to Q or to the full final charge.

An equation of this form can be made to fit, by a suitable selection of the constants, a curve such as that just mentioned, which rises quickly to a certain ordinate and then slopes upward almost in a straight line, but finally tends to a limiting ordinate. If, then, we take two non-absorptive condensers, and place in series with them inductionless resistances, and connect the two in parallel, and if we adjust the capacities and resistances so that the product of capacity and resistance (C_1R_1) for one is much smaller than the product (C_2R_2) for the other, we shall have an electrical arangement which can be adjusted to imitate more closely the behavior of a single condenser having absorption. It is also interesting to notice that such a system not only imitates the absorption, but imitates also the so-called residual charge effect of a condenser with a solid dielectric.

Maxwell has proved that a compound dielectric built up of layers or laminæ of different non-absorptive dielectrics should exhibit both absorption and residual charge effect, provided these laminæ each have dielectric constant k and dielectric conductance σ such that the ratio σ/k is different for each lamina, although every lamina by itself does not exhibit either absorption or residual charge. A justification for the hypothesis that the residual charge effect depends upon a want of homogeneity in the structure of the dielectric in that the value of $4\pi\sigma/k$ is different in different parts, is asserted to be found in the fact that most dielectrics exhibiting it are complex substances, such as glass, indiarubber, gutta-percha, etc. On the other hand, it has been found that an exponential formula, such as that given by Maxwell, does not agree with observation; and Prof. F. T. Trouton and Mr. Russ† have shown that the recovered charge can be much more nearly represented by a logarithmic formula.

The well-known analogous stress-strain phenomena in viscous elastic solids, such as glass, are capable of being represented by similar formulæ, but beyond establishing the fact that there is an analogy between the two effects the mathematical theories do not help us much to discriminate between different physical hypotheses framed to enable us to visualize the molecular processes at work.

On the other hand, the double condenser-resistance system suggested above imitates a tleast qualitatively the residual charge effect. If, therefore, we take two non-absorptive condensers—say, air condensers or oil condensers—and join one of them in series with a very high resistance, and one in series with a very low resistance, and place the two series in parallel, we can produce a compound condenser which imitates most perfectly all the phenomena exhibited by a condenser made with such a dielectric as glass or celluloid possessing absorption and residual charge. But, more, such an an arrangement will posess the quality that, whilst it has no permanent conductivity for direct currents, it has yet a true conductivity and energy disipating power for alternating currents. This quality is very marked in certain dielectrics, as, for instance, gutta-percha.

The arrangement will have no conductivity for direct currents, but an alternating conductance represented by

$$S=\frac{p^2S_1}{s_1^2+p^2}+\frac{p^2S_2}{s_2^2+p^2},$$

where S_1 and S_2 are respectively the conductances of the resistances R_1 and R_2, and s_1 and s_2 stand for the quantities $1/C_1R_1$ and $1/C^2R^2$.

If the ratio s is very small for one condenser and large for the other, the alternating-current resistance

*"The Polarisation of Dielectrics in a Steady Field of Force," "Proceedings" of the Physical Society, Vol XX., p. 186, 1910.

†"Proceedings" of the Physical Society, Vol. XX, p. 551, 1907.

would be a function of the frequency of the form $S=A+Bn^2$. It will be proved, however, in the second part of this paper that by far the largest number of cases the alternating-current conductance of a dielectric is a simple linear function of the frequency of the form $S=A+Bn$. Hence, it is clear that we cannot explain alternating-current conductance merely by hypothecating in the dielectric a resistance of the nature of a metallic resistance. We must assume that some form of energy dissipation exists in the dielectric which is proportional to the mean-square valve of the impressed electric force and to the frequency of the alternations, whilst superimposed on this we have also a conductancy of metallic or electrolytic type.

The view that we have two different kinds of conductivity simultaneously present in a dielectric receives support from the recent interesting experiments of Jaffé and of Hodgson.* Starting from the observation made originally by P. Curie, that the conductivity of solid and liquid insulators is increased by exposing them to radium radiation, Jaffé found that the current through a dielectric exposed to radio-active bodies may be divided into two parts—one which obeys Ohm's law, and an ionization or convection current which does not obey it, at least when the electric force in the dielectric exceeds a certain limit. The current obeying Ohm's law is probably electrolytic in nature, and, according to Jaffé, is chiefly due to impurities. The ionization current is a convection current due to the presence of mobile ions or electrons, as in the case of gaseous conduction, and it has a saturation value. If, in addition to this, there is any true direct-current conduction, there must be a small number of free electrons present. As regards direct-current conduction, all good dielectrics have excedingly high resistivity of the order of a hundred million megohms per centimetre cube. By most careful purification of the dielectric, that part of the conductivity which obeys Ohm's law can be almost removed. On the other hand, there remains a true alternating-current conductivity, which is nearly proportional to the frequency and increases very rapidly with temperature in most cases. The interesting question then arises: What is the explanation of this last conductivity?

Since the electron theory of electricity has provided an hypothesis from which we can logically deduce the chief facts of metallic and electrolytic conduction, it is natural to ask of it a similar service for dielectric conduction.

Metallic conduction is explained on one theory by the assumption that in the interstices of the metallic atoms of a conductor there are free electrons in the act of passing from one atom to another. If an external electric force acts on the free electrons in one direction it causes a unidirectional drift. In most dielectrics at ordinary temperatures the direct-current conductivity is very small. Hence the free electrons must be very few in number.

The characteristic quality of a dilectric is that we can produce in it an electric displacement proportional to the impressed force, which, however, is of a purely elastic type, and vanishes when the force is removed. This must be accounted for by the presence of displaceable ions which elastically resist displacement with a force proportional to the displacement.

*"Annalen der Physik," Vol. XXV., p. 257, 1908; and "Philosophical Magazine," Vol. XVIII., p. 252, 1909.

Suppose, then, that an electron is held tethered to one spot by a force which is proportional to the displacement when the electron is disturbed. If an external alternating electric force acts on it, periodic displacements of the electron would be created, but in any time, long compared with that of the periodic time, no power on the whole would be expended, since the work done in creating a displacement is given back again when the displacement vanishes, provided these forced oscillations have a periodic time which is large compared with the natural time period of oscillation of the electron. Suppose, however, that the constraint on the electron is of such a nature that when it is displaced beyond a certain point it falls over into a new position of equilibrium. The work expended in creating this displacement would be dissipated as electric radiation in the rapid oscillations which the electron would execute about the new position of equilibrium. If the process of carrying the electron backwards and forwards between the stable positions is repeated n times per second, then the power expended would be proportional to the square of the impressed force, and to the frequency n of the forced oscillations, or to BnV^2. In this case, then, the equivalent or alternating conductivity would be proportional to the frequency.

We can then account for many of the observed facts conected with dielectrics on the following hypothesis: Let it be assumed that in a dielectric there

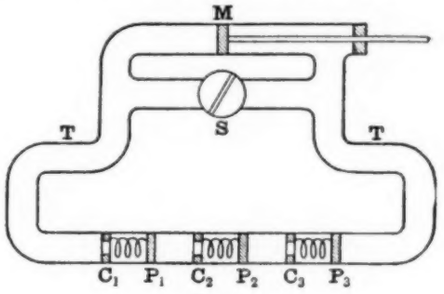


Fig. 1.

are three classes of displaceable electrons or ions: (1) Electrons which under the action of a unidirectional or alternating impressed electric force are elastically displaced from a position of equilibrium. If the force is alternating, no power would on the average be expended in maintaining these forced oscillations. The flux of electrons thus taking place across any section of the dielectric constitutes the true capacity current, and is proportional to the frequency and to the impressed force. If the periodic time of these forced oscillations is large compared with the time of free vibration of the electron when left to itself to execute free vibrations, then but little energy will be lost by radiation. (2) Other electrons or ions must be present which can be displaced from a position of equilibrium, but with increasing displacement are brought into an unstable position from which they fall freely into a new position of equilibrium and dissipate the energy expended in displacing them in the form of electromagnetic waves due to the rapid oscillations about the new position of equilibrium. If this process is repeated first in one direction and then in another we have a flux of electrons across any section of the circuit. The alternating current so produced is proportional to the frequency of movement from one stable position to the other. (3) There must be a

relatively very small number of free electrons which contribute to produce the constant or direct-current conductivity.

It follows from these assumptions that a dielectric must possess dielectric constant k and true capacity, and also an alternating current conductivity, σ, approximately of the type $\sigma=a+bn$, where a and b are constants at any given temperature and n is the frequency of the impressed force. Therefore S/Cp will not be constant unless the quantity a in the above expression for the conductivity is very small. If it should happen that the quantity a is small compared with bn, then the quantity S/Cp will be independent of frequency.

To account, however, for absorption and the residual charge effect we have to assume that there is some yielding of the point of support to which the elastically displaceable electrons which produce capacity are tethered. This may best be seen by the help of a mechanical analogue.

Suppose we have an endless tube filled with some liquid, say oil (*see* Fig. 1). At one point in the tube let there be a piston, M, which can be moved by an external applied pressure. This is equivalent to an E. M. F. Let the tube have a by-pass with stop-cock S in it shunted around this piston. Let there be also a number of frictionless pistons, P_1, P_2, P_3, etc., in the tube, each of which is attached to a spiral spring, the other end of the spring being fastened to rings C_1, C_2, C_3, etc., fiting into the tube, but which ring can in some cases slip with friction in the tube so as to displace the points o fattachment of the frictionless piston.

Suppose, then, that we apply a constant pressure to the main piston, the bypass stop-cock being closed. The liquid would be forced around the tube as far as the elastic constraint of the frictionless pistons will permit. This is equivalent to E. M. F. acting on a condenser, and the pistons represent the elastically displaceable electrons. Suppose the applied pressure removed, the pistons will spring back and reverse the flow of the liquid. This corresponds to the discharge current of the condenser. If, however, some of the points of attachment of the controlling springs slip gradually along the tube, then the first sudden displacement of the other pistons or of the liquid will be followed by a still further slow displacement under the action of the constant impressed force. This corresponds to the absorption current of the condenser. Again, when we release the applied pressure, there will be a sudden springing back of the pistons and of the liquid, followed by a still further slow movement as the point of attachment of certain of the pistons gradually slips along the tube. This corresponds to the subsequent small outflow of current after the first discharge from any condenser having absorption.

Also, the same model will illustrate the residual charge effect. For if we suppose an impressed force applied to the main piston so as to create a displacement of the liquid in the tube, and if we assume that the stop-cock is shut, we have a state analogous to that of a condenser which has been charged and then insulated. Imagine, then, that the points of attachment of certain of the pistons slip so that these pistons cease to be under elastic restraint. If, then, we open the stop-cock and let the liquid flow, these pistons, the supports of which have not yielded, will force the liquid back, but will put a reverse displacement on the pistons whose supports have slipped. Suppose, then, we shut the stop-cock and wait again, a second slipping of the same points of support will take place, and, on opening the stop-cock a second time a still further flow back of the liquid will take place in the same direction as the first return. This is quite analogous to the residual charge effect in condensers. Hence we see that both absorption and residual charge effect may arise from the same cause —viz., some slipping of the point of attachment of the constraint of the elastically displaceable ions.

In the dielectric, therefore, we may assume that the point to which the elastically displaceable electrons are constrained is not a fixed point in space, but is some part of an atomic or molecular structure or ion which slowly yields under the applied E. M. F., and that this yielding takes place more in some parts than in others in the dielectric. We should expect to find it, therefore, exhibited in dielectrics of complex chemical composition. As a matter of fact, the dielectrics like glass, celluloid, india rubber, gutta-percha, etc., which exhibit the phenomena of absorption and residual charge are composed of mixtures of various substances. Before, however, we indulge in further speculation as to the mechanism of these dielectric effects it will be best to describe the experiments we have made and the results obtained.

(*To be concluded.*)

Telephones in Pennsylvania Commission Report

The introduction to the annual report of the Pennsylvania State Railroad Commission for the year ending December 31, 1911, says regarding telephone service and rates:

The subject is one presenting unusual difficulties, since it differs in almost every essential element from the characteristics presented by the question of rates of every other carrier, as, for example, the cost of service increasing to the subscriber as the number of subscribers on a given exchange increases, making the rates in a large community higher than those in a small one presenting the same physical difficulties to be overcome; also the question of distance and contour of the country through which toll lines are constructed and operated; and the difference in the quality of service demanded in the different communities and localities. These are some of the elements met with which tend to render the attempt at equalization of rates by any rule generally applicable through the state apparently impracticable.

After much consideration the only practicable way which the commission could see of determining the reasonableness of local rates was on the unit or local exchange basis, and thus taking up each case as it arose and making an analysis of the conditions of the service within the limits of the particular exchange or locality in which the complaint originated. This plan has been productive of apparently satisfactory results, as is evidenced by the expressions of appreciation received from the complainants, as well as by the increased number of complaints from other localities.

Michigan Merger Delayed By Commission

The merger of the Citizens' Telephone Company, and the United Home Telephone Company, operating independent telephone exchanges in nearly every city and town along the lake shore from Muskegon to Cadillac, Mich., was halted by Railroad Commissioner L. T. Hemans, who ruled that the proposed issue of $160,000 of stock of the combination could not be put on the market until an expert engineer had appraised the properties and reported to the commission.

The Law and the Telephone

By E. J. Wenner

COURT TAKES JUDICIAL NOTICE OF THE HISTORY OF INDEPENDENT TELEPHONES IN MISSOURI—A CONTRACT BETWEEN TWO LOCAL COMPANIES FOR EXCLUSIVE CONNECTION HELD VALID—STATUTE REQUIRING ONE LINE TO RECEIVE DISPATCHES FROM OTHERS DOES NOT COVER PHYSICAL CONNECTION.

THE plaintiff and defendant companies having operated independent lines in Jasper county, Missouri, agreed with each other for the exclusive physical connection of their exchanges for the transmission of messages from one company to the other. Plaintiff company agreed to build a line to the exchange of the defendant company, and it was understood the contract for exchange of business was to be operative for a period of twenty-five years and longer until one year's notice of termination was given.

The two companies were largely owned and controlled by the Kinloch Telephone Company and were a part of this independent system built up for local and long distance purposes in the state of Missouri. The Missouri and Kansas Telephone Company commonly known as the Bell Company, acquired ownership of a considerable portion of the stock of the defendant company and later entered into a contract with the defendant company for the transfer of business. The defendant company refused to carry out its exclusive contract with the plaintiff and insisted on connecting with the lines of the Missouri and Kansas Telephone Company. All this to the damage of plaintiff.

Plaintiff sought to restrain the defendant from carrying out its agreement with the Missouri and Kansas Telephone Company on the ground that the contract between plaintiff and defendant was exclusive and on further ground that defendant was violating its contract in allowing other lines to connect with its exchange and to transmit business into localities covered by plaintiff's exchanges. Plaintiff also alleged that the conduct of defendant was damaging to plaintiff, and that on account of defendant's refusal to comply with its contract, plaintiff had been damaged in the amount of $10,000, and judgment for that amount was asked.

The defendant claimed the contract illegal and void as being in restraint of trade and violative of the laws pertaining to pools and monopolies. Defendant also claimed that the contract in suit could not be exclusive and that if physical connection were allowed to one company it could not be denied others.

As a preliminary to the opinion the Supreme Court referred to the fact that the real issues in the case were between the Kinloch Telephone Company upon the one side and the Bell Company upon the other. The court said it must take judicial notice of the history of telephones in the state of Missouri, and cites a decision of the Missouri Supreme Court in which it is stated that courts must take judicial notice of facts of current history etc. "This, because courts should not admit themselves more ignorant than the rest of mankind."

We quote from the decision following:

That the contract involved in this case was one of a number made during this period of developing competition to the Bell Company is apparent. Time developed the fact that a farmer or merchant would not leave his farm or his store to talk through the long distance booth of one company located in the town, when he could connect at his farm or his store with another long distance telephone company reaching the same place. When this dawned upon the other competing company, independence became activity, and indifference was wrought into a desire to serve all the public by a direct and physical connection. This much is general public knowledge. In the light of the surroundings and the law, statutory and otherwise, we must construe this contract.

The Sarcoxie Company, now physically connected with the Bell Company, says the contract is void, although the consideration has been fully paid and performed by the Home Telephone Company. By the terms of the contract, the Home Company was to build a line from Carthage to Sarcoxie. This outlay has been made, and the Sarcoxie Company has enjoyed the benefits of this expenditure. Unless flagrantly violative of law, good conscience would demand the fulfillment of the agreement.

The Supreme Court disagreed with the contentions of the defendant and held the contract legal and valid on the theory that a public service corporation can grant an exclusive connection with another corporation similarly engaged without the necessity of holding out the same offer to all similar corporations, and held specifically that such a contract was not prohibited by the statute with reference to pools and trusts.

With particular reference to the statute requiring telephone companies to receive dispatches from other lines and upon payment of the usual charges to transmit them over others, it held that such phraseology does not contemplate a physical connection between the several lines, but only the obligation to transmit such messages as are delivered to the connecting line. They might be delivered from one company to another in the same manner as telegraph messages are delivered.

In closing the opinion the court used the following language: "As before stated, the defendant has enjoyed the benefits of the contract, and evidently through its new friend is now pleading public policy. Such pleading comes with little grace in a court of equity. The matter of remedy is not seriously questioned, and, if it were, we could not say that equity should not interfere, under the statements in the bill.

The cause should be reversed and remanded, to be proceeded with under the views herein expressed. It is so ordered."

Home Telephone Co. vs. Sarcoxie Light and Telephone Co., 236 *Mo.* 114; 36 *L. R. A. N. S.* 134.

TELEPHONE COMPANY MAY GIVE REBATE TO CITY UNDER WHOSE PROTECTION IT OPERATES

The New York Telephone Company brought suit against the Siegel-Cooper Company in the courts of New York to recover $35,928.92 and interest for telephone service rendered the defendant between January 1, 1908, and October 1, 1909. The defendant claimed

that inasmuch as the city of New York was granted a 25 per cent discount or rebate on its bills, that the defendant was entitled to the same discount on the charges made to it.

In June of 1907, the defendant company contracted with the plaintiff for a switch board and 1014 sets of telephones in its New York department store. The defendant was to pay $17,502 per year and to have a right to 320,000 local messages per year with a charge of four cents each for messages in excess of that number. The defendant claimed that it learned of the discount allowed the city in January of 1908, and refused to pay its telephone bills rendered subsequent to that date.

The decision in the case is of considerable importance to telephone users, and in fact to all patrons of public service corporations, for it brought squarely before the court the question as to whether rebates might be allowed to any particular person or class of persons as against general users. The court took the position that the discrimination was not against any particular individual and in favor of any other, except the city of New York, charitable institutions and regularly ordained clergymen and decided the case upon the theory that these classes might legally be favored. The court held particularly that the franchise given by the city was of immense value and that nothing was paid for it, except favors granted by the telephone company; that charitable institutions were not money making propositions and that clergymen were usually extended the same privileges as charities.

In its opinion the court made use of the case of U. S. vs. C. & N. W. R. R., 127 *Federal* 785, in which it was held that in common law it was considered lawful to allow ministers of the gospel to travel for one-half fare; that they do not come into competition with business men and no injustice is done any one. The court in that decision stated, however, that should the railroad company charge ministers of one denomination full fare and those of another half fare, there would be an unlawful and unjust discrimination, both at law and under the statute.

The case of Superior vs. Douglass County Telephone Company (Wisconsin) 122 *N. W.* 10223, holds that a telephone company operating in a city may agree to furnish telephones to the different public offices of the city without charge, and that such an agreement is not contrary to public policy; that it is not discriminatory and does not in any way contravene the constitutional provision against impairing the obligation of contracts.

Wilcox vs. Consolidated Gas Company, 212 *U. S.* 19 expressly holds that a charge of $0.75 per thousand feet to the city of New York and $0.80 per thousand feet to the private customers is lawful and that there is no unreasonable discrimination. The city granted the franchise to the gas company and was entitled under the law to make a contract for a more favorable rate than that given to private customers.

Concerning the claim of discrimination in the incident case, the court made use of the following language:

No discrimination was made by the plaintiff in favor of any class of customers, except the three expressly named; and for time out of mind discounts have been allowed by common carriers and others conducting a business in which the public has an interest for services rendered to clergymen and institutions of charity, because they are engaged in the work of benefiting mankind, and are supported by contributions from the public. For these reasons, their property is exempt from taxation wholly or in part. They carry on no business, do not compete with others, and are not engaged in making money. It is the general belief that they render full value for what they receive by caring for the sick and wounded, or helping all to lead orderly lives.

The parties expressly stipulated that the charitable institutions in question are performing services of special benefit to the community as a whole, are worthy of charitable assistance, and have long been accustomed to receive contributions from members of the general public. They further stipulated that the discount to the city of New York was allowed on account of its intimate relation to the plaintiff, through its control of streets and its power of regulation, "as a contribution to the expense and cost of the government of the city of New York." The plaintiff received from the city for a small consideration a franchise of immense value, without which it could not carry on its business at all. While under no legal obligation to discriminate in favor of the city, there is a strong equitable obligation to do so, founded on benefits received, and supported by custom. All the reductions are of commercial value to the paintiff as an advertisement of its business, and they tend to increase its patronage by making the management popular. It may be further said that, as one of the favored classes through limitation of means might not subscribe for telephone service at all, and the other two only to a less extent, unless a discount were allowed, while many general customs would wish to communicate with all three, the discrimination made the general service more valuable. We regard these considerations as material in determining whether the favored classes are in a different situation and are surrounded by different circumstances from those affecting the other patrons of the plaintiff.

Moreover, the law against unreasonable discrimination rests on public policy. It is forbidden because it is opposed to the interest of the public, which requires that all should be treated alike under like circumstances. Discriminations, however, in favor of the public, are not opposed to public policy, because they benefit the people generally by relieving them of part of their burdens.

The discriminations in this case were adjudged neither unreasonble or unjust, because they were in favor of the public, and favored classes in different situations than general subscribers. The judgment of the court below was affirmed.

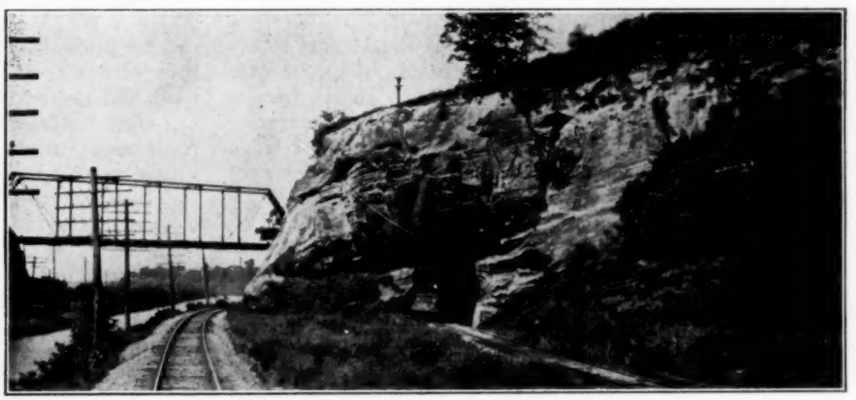
New York Telephone Co. vs. Siegel-Cooper Co. 202 *N. Y.* 502; 36 *L. R. A. N. S.* 560.

No Disease in Telephones

The announcement that the reputation of the public telephone mouthpiece as a possible means of spreading consumption had been cleared is the result of a series of investigations recently undertaken by Dr. Harold Spitta, bacteriologist to the British royal household. Mr. Samuel, the postmaster general, who authorized the undertaking of the investigation, stated that Dr. Spitta had reported that, in his opinion, "the transmission of tuberculosis through the medium of the telephone mouthpiece is practically impossible."

Mouthpieces were taken from telephones in public offices, as well as from instruments in a sanatorium which were devoted exclusively to the use of consumptives. The mouthpieces and the discs at their bases were were first carefully washed in a small amount of sterile water. The water was then injected under the skin of a number of healthy guinea pigs. A large number of experiments extending over many months were made, but in no instance did a guinea pig develop any signs of tuberculosis. Referring to the use of living animals for the tests, a London physician stated: "There is no other test anything like as certain or accurate as this."

Telephone service between Paris and Madrid is successfully inaugurated. The distance is about 1,000 miles.

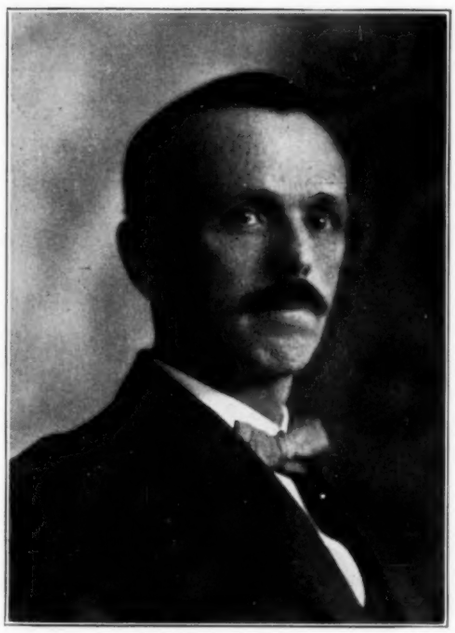


The Fishing Club of the D., N. W. & P.

C. A. Parker, Supt. of Telegraph

OUT in Colorado, the railroad advertisements tell you, the simple, unsophisticated mountain trout seize eagerly anything that looks like a hook and wrestle with it in a most violent manner. About this time of year, or perhaps a little earlier, these wild creatures become absolutely ferocious. The *Salvelinus Fontinalis, Salmo Irideus* and other tribes of this region form a serious menace to the progress of civilization. Men otherwise sane have been known to speed weeks in a vain effort to kill off the remnants of the race, when in the same period of time they might have built several miles of railroad or installed a new telephone exchange.

So serious has this danger become that a small, exclusive club has been organized, with headquarters in Denver, with the avowed purpose of attacking the enemy in its strongholds and reducing its forces one by one. To this noble work an entire fortnight is devoted every year, and marked progress has been made. The vice-president and secretary of the club is C. A. Parker, Mrs. Parker acting as president and treasurer and their three children as the directors. The club membership is limited to five.



C. A. Parker, D., N. W. & P.

To Colorado from New Albany, Ind., is a far cry, as the writers used to say. There are no trout at New Albany, although the festive shiner and stoical bullhead still haunt the waters of Silver Creek, and there are those who claim that jugging for catfish in the Ohio river is equal, in the way of sport, to whipping an ice-cold Colorado stream with a Silver Doctor or a Parmachone Belle. At any rate C. A. Parker was born at New Albany September 2, 1859, and spent his early days in laying the foundation for later success with the nine-foot bamboo rod and the gut leader.

In July, 1879, a more serious note vibrated through the career of our hero, then not quite twenty years of age. He entered the employ of the American Union Telegraph Company, which was then constructing lines on the Wabash Railway.

Once in the railroad game, miles are merely convenient units to juggle into abstruse rate calculations. In another year Parker was repairing lines on the Union Pacific in Wyoming, eleven hundred miles from that dear old New Albany, Ind. And he kept it up until 1883, when he became foreman of construction for the Western Union Telegraph Company in Colorado. He stayed with that job for four years, acquiring a profound knowledge of the uses of wire and a genuine love for the western country.

It was quite a step to general foreman of the Denver and Rio Grande Railroad in 1887. Parker liked it, though, and did so well that in another four years he was appointed superintendent of telegraph of the D. & R. G., and allied lines. This time he successfully overcame that four-year habit and pursued the even tenor of

Department of Railway Telephones

This department is established as a permanent feature of TELEPHONE ENGINEER. The progress of the art of telephone train dispatching, its technical development, its news, and the elucidation of its mysteries for the non-technical worker will be found each month in these pages. The editors invite the problems and solicit the co-operation of the many readers of TELEPHONE ENGINEER in all parts of the world whose interests lie along these lines.

The Fishing Club of the D., N. W. & P. 35-36
Santa Fe Will Install More Telephones 36
Telegraph Superintendents' Annual Meet 37-38
St. Louis Terminal Telephone Facilities. By F. E. Bentley 38-39
Equipment of Piedmont and Northern Lines 40-41
How Telephones Helped the Santa Fe. By L. M. Jones 42-43
Main Line Relays in Selector Operation. By W. W. Ryder 45

his incumbency until 1901. Then he became, and is now, superintendent of telegraph of the Denver, Northwestern & Pacific Railway, familiarly known as the Moffat Road.

C. A. Parker's personal hobby outside of the beforementioned club, of course, is the welfare of his friends and employes. This peculiar fad he is able to exercise without leaving his desk. For the two weeks of trout fishing and the spring and fall duck shooting he leaves his office, but not necessarily his road. The D. N. W. & P. strikes the Rockies thirty-five miles out of Denver, and from there to Steamboat Springs is one grand vista of mountains, gulches, streams and falls. No wonder he likes it!

Mr. Parker makes a business side line of quartz mining in Colorado and Mexico. A quartz mine, children, is an arrangement for squeezing hard rock until gold or silver oozes out of it—which is regarded in some quarters as an easier process than extracting it from a railroad.

These varied activities, together with an active membership in the Association of Railway Telegraph Superintendents and the fact that the D., N. W. & P. uses telephones over its whole system of 214 miles, keep time from hanging heavy on the hands of C. A. Parker.

Santa Fe Will Install More Telephones

This year the Santa Fe expects to install telephones along its Strong City-Superior branch and to handle trains by telephone over that line. The work is waiting upon an appropriation. Two heavy copper wires are required, besides special instruments.

The Santa Fe is now handling all its main line trains by telephone and the same system is being used on some of the most important branch lines. Dispatchers who have used telephones in handling trains are enthusiastic about them and usually express regret when an accident to the telephone lines sometimes requires resort to the telegraph key. By using heavy copper circuits and special telephone instruments the voice of a dispatcher is easily carried to the ends of the division, and could as easily cover two divisions. A person listening in on one of these telephones at a way station can hear trains passing the dispatcher's office, conversation in the office, etc.

The railroad telephones effect quite a saving in time, according to the officials. This is particularly the case in the repeating back of train orders, a process which frequently took much time with poor telegraphers at small stations. The loud gongs on the telephone instruments are also more effective in attracting the attention of station agents than was the feeble ticking of the telegraph key. If the agent is at the end of the station platform unloading freight he can't help hear his call.

Wireless Interference on Telephone Lines

In wireless stations where there is a telephone in the same room or even in the same building, it is often noticed that the signals being transmitted by wireless can be heard in the telephone receiver, says A. B. Cole in *Popular Electricity*. The question has been asked several times whether it would be possible to eliminate this condition by grounding the telephone and the wireless outfit on different pipes.

This would do little good because the gas, water and steam pipes are nearly always well connected electrically by the earth through which they pass, and because the action is not one of induction, but is due to the fact that the telephone acts as a wireless receiving outfit. The line wire acts as the aerial and the ground is common to it and the wireless set.

The telephone transmitter consists of a carbon cup containing carbon grains in a comparatively loose condition, and a carbon or metal diaphragm rests against the opposite side of the grains. The transmitter acts as one of the old style "auto-coherers," and the receiver is in electrical connection with it.

The sound in the receiver is not generally sufficient to cause inconvenience to the person using the telephone. Sometimes, however, difficulty will be experiencd in enabling the person at the other end of the line to hear distinctly, especially after the wireless apparatus has been in use for a considerable length of time. This is due to "packing" of the carbon grains and can be remedied by tapping the telephone transmitter with a pencil or some other light object, when the grains will return to their original condition.

Lines for North China

Consul General Samuel S. Knabenshue, Tientsin, China, says the telephone mileage in Tientsin on December 31, 1911, was 2,122, and number of stations 1,831—increases of 40 miles and 33 stations in 12 months. The figures for Tientsin will be practically stationary for the present year, owing to the fact that the switchboard is filled, and there can be no increase in number of stations until the entire telephone system of this city is rebuilt. It is intended to undertake this work as soon as possible this year, but even though the new material were ordered immediately the new system could not be in operation until some time in 1913.

In Peking on December 31, 1911, there were 2,136 telephone subscribers, an increase of 505 in 12 months, while 1,434 miles of bare wire and 5,056 miles of cable core were in use. The unsettled condition of business at present and the lack of capital alone prevent a very great increase in the use of the telephone. The Chinese in Tientsin and Peking thoroughly understand the advantage of telephonic communication, and it is only a question of time, plus normal business conditions, to witness an extraordinary development. The trouble in this country is the lack of long-distance lines, the longest at present being about 120 miles.

Municipal Plant Threatened in Indiana Town

A report that George W. Beers of Fort Wayne, president of the Delaware & Madison County Telephone Company, had said the company considered selling its property to the Bell system has caused Anderson (Indiana) authorities to investigate the franchise under which the independent company is operating in that city. City Attorney Sansberry found that, should the independent company sell ten per cent of its property, the proceeds would go to the city, and should the Bell people abandon the local exchange of the operating concern all the property of the company in this city will revert to the city. Local authorities are watching developments with the view of installing a municipal telephone company in the event of the sale. It is said that the property of the local company is valued at $500,000.

Telegraph Superintendents' Annual Meet

New York, June 4 to 7

THE four days' session of the thirty-first annual convention of the Association of Railway Telegraph Superintendents, which opened at the Waldorf-Astoria Hotel, New York City, June 4, was of equal interest with its predecessors and was marked by a good attendance, a large number of the members being present for the opening, as well as many of their wives and daughters. The meeting was opened by G. A. Cellar, Pittsburg, president of the association, after which a number of new members were elected.

In his regular annual address President Cellar gave an extensive review of the business of the association for the past year and spoke in most optimistic terms of its prospects for the coming year, predicting a prosperity beyond anything hitherto attained by it. He suggested that a more favorable month be selected for the convention and the next one will be held May 20, 1913, in St. Louis, Mo. Mr. Cellar made special reference to the Reid memorial, stating that telegraph superintendents are particularly interested in anything connected with the memory of the one who was practically the first telegraph superintendent. There was a discussion of the relations which should exist between the association and the Railway Telegraph and Telephone Appliance Association and it was suggested that a missionary campaign be inaugurated with a view to enlisting its membership. Mr. Cellar closed his address by extending a vote of thanks to the different committees for the interest they had manifested in the work of the association.

The membership consists of 105 active members and 64 associate members. Reports showed the association to be sound financially and the membership increasing. Following the various reports papers were presented by R. E. Chetwood, engineer of construction of the Western Union Telegraph Company, New York, on "Construction Materials and Methods," which brought out a long and interesting discussion; "The Handling of Supplies," presented by W. G. Higgins, superintendent of supplies of the Western Union Telegraph Company, New York, was followed by discussion, as was also the paper presented by William Maver, Jr., New York, on "Some Notes on the Polarized Sounder in Telegraphy," which was accompanied by a demonstration of the machine in action. The first two papers were presented in abstract by the authors, copies of the paper having been previously distributed among the members.

Wednesday's session opened with a talk by Belvidere Brooks, general manager of the Western Union Telegraph Company, who spoke of the amicable relations existing between the telegraph and railroad companies, and he in turn was followed by Angus S. Hibbard, of the American Telephone and Telegraph Company, who spoke of the relations existing between telephone and telegraph companies in practical operation, and referred in detail to the methods used and the advantages accruing to the public.

"Telegraph and Telephone Facilities of the St. Louis Terminal" was the subject of a paper presented by F. E. Bentley, superintendent of telegraph of the Terminal Railroad Association, St. Louis, Mo. A paper which brought out extended discussion was presented by W. W. Ryder, general superintendent of the New York Central Lines, Chicago, on the subject, "Use of the Main Line Relay in Telephone Selector Operation." This discussion was participated in by W. E. Harkness, V. T. Kissinger, William Bennett, G. K. Heyer, W. L. Cook, W. J. Camp and L. M. Jones, who spoke of the good points and defects of this method of selector control which they had noted in their experience.

"Telegraph Traffic" was the subject handled by W. H. Fashbaugh, traffic engineer of the Western Union Telegraph Company, New York, which brought out considerable discussion, participated in by Charles Selden, who explained the method of handling traffic on his lines, and E. C. Keenan, who stated that his road found the telephone superior in every way in handling traffic.

Thursday's session was devoted to various matters of business which included the appointment of a committee for the enlargement of the membership, the presentation of resolutions and the election of officers, which resulted as follows: President, J. B. Sheldon, Union Pacific, Omaha, Neb.; vice-president, William Bennett, Chicago & Northwestern Railroad, Chicago; second vice-president, A. B. Taylor, New York Central Lines, New York; secretary and treasurer, P. W. Drew, Minneapolis, St. Paul & Sault Ste. Marie Railway, Chicago. The following papers were then read: "What the Telephone Has Done for the Santa Fe Railway," by L. M. Jones, of the Atchison, Topeka & Santa Fe Railway, Topeka, Kans.; "Maintenance of Telegraph Lines," G. M. Yorke, engineer of the Western Union Telegraph Company, New York; "The Use of the Portable Telephone in Railroad Service," by J. F. Caskey of the Lehigh Valley Railroad, South Bethlehem, Pa.

Ample provision had been made for entertainment, including luncheons, theater parties, etc. Friday was spent in visiting the Edison Works at West Orange, N. J., where luncheon was served, and the convention closed with a banquet Friday night at Martin's, Broadway and Forty-second street.

The following new active members were added to the association: C. G. Baird, manager telegraphs and telephones, Pennsylvania Railroad, New York; C. P. Dugan, superintendent of transportation, Norfolk & Southern, Norfolk, Va.; C. A. Worst, assistant superintendent of telegraph, Chicago, Burlington & Quincy, Chicago, Ill.; E. E. Backus, superintendent telegraph, El Paso & Southwestern, El Paso, Tex.; Robert H. Corson, telephone inspector, Erie Railroad, Jersey City, N. J.; C. H. Hubbell, superintendent telegraph, Chicago, Rock Island & Pacific, Chicago, Ill.; D. J. Kavanaugh, assistant general foreman, Illinois Central, Memphis, Tenn.; C. E. Marsh, chief clerk to general superintendent, Kansas City Terminal, Kansas City, Mo., and B. S. Jenkins, general superintendent telegraph, Western Lines, Canadian Pacific Railway, Winnipeg, Man.

The association also gained the following associate members: B. S. Stewart and R. E Green, Standard Underground Cable Company, Chicago, Ill.; C. S. Pflasterer, National Carbon Company, Cleveland, Ohio; H. T. Vaille, railroad agent, Mountain States Telephone and Telegraph Company, Denver, Colo.; F. J. Lepreau, salesman, Thos. A. Edison, Inc., Chicago, Ill.; William Henry Jaques, vice-president and general manager, United Telephone Company, Boston, Mass.; J. W. Young, Kerite Insulated Wire and Cable Company, New York; C. S. Rhodes, Jr., General Railway Equipment Company, New York; Claude L. Matthews, vice-president, W. N. Matthews & Bros., St. Louis, Mo.; R. E. Chetwood, engineer of construction, Western Union Telegraph Company, New York.

G. C. Kinsman and J. S. Stevens, former superintendents of the Wabash and Chesapeake & Ohio railroads, respectively, were elected honorary members of the association. P. W. Drew, who was re-elected secretary and treasurer, has held this position from the first, having served under thirty different presidents.

Resolutions of respect were passed on the death of the late I. T. Dyer, of the San Pedro, Los Angeles & Salt Lake Railroad, Los Angeles, Cal., who was formerly president of the association, and J. G. Jennings, of the Chicago, Rock Island & Pacific Railroad, Chicago.

St. Louis Terminal Telephone Facilities

By F. E. Bentley*

At St. Louis Union station, the main telegraph office on the fifth floor above basement or track level, is equipped with seventy-six telegraph wires, all but six looped from the Western Union main office; also four telephone circuits. Twenty-three telegraph wires and three telephone circuits are exclusively dispatchers' lines; the remaining fifty-three telegraph wires and one telephone line used for message work are cut onto eight sextette-instrument tables. All of the seventy-six telegraph wires are cut from the regular switchboard to another one improvised of Dean telephone jacks, eight strips of ten jacks each. A monitor operator at the jack-switchboard, using plug and cord on telegraph instrument, plugs in on each telegraph wire at intervals of ten to twenty minutes; answers calls; has an operator in the room, if one is available, get the message, otherwise takes it himself; gets off any miscellaneous rush messages, and helps out the chief operator, besides keeping a record of the condition in which he finds each wire—quiet, busy or open. If quiet, he announces his presence by saying "I I, U D," thus giving any office on that wire a chance to get him.

Telegraph and telephone message circuits on the eight tables are divided into districts, each operator working six or eight and these operators also record the condition of the wires at less regular intervals, and likewise announce their presence at quiet wires. As each operator is credited with the number of messages he handles, a daily average service account being kept and filed for their inspection, they are careful to record every message sent and received. This not only spurs the operators to handle all the messages they can, but together with the wire condition record and miscellaneous notations on the call sheets, makes a complete supervisory record that line offices seldom assail successfully.

The chief operator and assistant chiefs distribute equipment orders and stock reports to the various departments and between the tenant railroads. When a line office has an equipment order to send, he says "coach," and our operator makes the required number of copies, eight or ten as the case may be, on typewriter at one writing and direct from the wire, thus saving delay and work. "Coach" manifolds of tissue blanks are kept set up and handy for operators' use. Stock and time freight reports are handled in a similar way. This office is different from the ordinary railroad relay office in that a scattering few messages are handled on numerous wires, instead of a great number of messages on a few wires.

The telegraph arrangement has remained practically unchanged since first installed when the Union station was opened in 1894, excepting that train wires were taken off the table in 1904, operators devoting all their time to working and watching message wires. The telephone circuits were added during the past year.

The twenty-three telegraph and three telephone dispatching circuits are looped to the train order office which is located in the stationmaster's cabin on track level, south side center of midway. There also the telegraph wires are in an improvised Dean telephone jack switchboard and the telephone circuits terminate in a special jack box with one desk set instrument on cord and plug made to work in common on all lines. Separate telephones on an adjacent table are permanently connected for use by road officials without bothering the operator. None of the road's dispatching wires is kept cut onto an instrument. Operators plug in when necessary to get orders or reports, or when told by main office to answer on any wire.

At that office passenger conductors of twenty-three roads register, call for mail, messages and orders, and leave reports which are usually sent to the main office through pneumatic tube for wire transmission. One operator handles train orders for those roads which use that office, and another operator gets hourly bulletins of incoming trains, making ten copies at one writing, distributes them to the various departments, and sees that the bulletin board is posted and changed. An inbound train sheet record is made, so that any inaccurate figure given by a road dispatcher may be corrected after the train strikes Terminal rails and before it reaches Union station. A daily average of about 2,500 messages, orders and reports are handled at these two offices, nearly 400 telegrams between local offices which have no direct telegraph connection.

A question for discussion, and no doubt a timely one, is: Should not telegraph and telephone offices, both commercial and railroad, at large passenger terminals, be combined and centrally located on or near the track level, with the view of convenience for trainmen on the railroad

*Paper presented at the annual convention of the Association of Railway Telegraph Superintendents, New York, June 4, 1912.

side and patrons of the commercial companies on the other, thus economizing space and labor expense?

The telegraph is used for train dispatching, one wire covering the Merchants' route, with eight block towers, six of them interlocking plants; another, the Eads route with five towers, all interlocking plants, and the extension to the east side belt line with two additional interlocking towers.

A message wire encircles both the Eads and Merchants routes, starting from and returning to the main office at Union station, being connected also with relay depot and the Terminal agent's office, East St. Louis. It is also used for time signals and to set one time clock which could not be reached by Western Union time service.

Two private branch exchanges at the Union station and thirty-two private lines between various points, with over 400 telephones are used in Terminal telephone service, handling a daily average of about 12,000 connections. One private branch exchange is connected by junction circuits with eight of the other fifteen railroad private branch exchanges in St. Louis, as well as by trunk lines with the St. Louis main exchange. Unlike the unchanging telegraph arrangement, telephone facilities not only at the Union station, but over the entire Terminal property and in offices of the various railroads have been a lively and growing proposition for the past fifteen years.

As the different departments feel the need of additional telephones, instruments are placed here and there, subjct of course to the eagle eye of the management as to expense, but each addition is a gradual approach to the ideal situation of a telephone on the desk of every clerk and official needing one, which must be accomplished before Mr. Vail's idea of a telephone in every home can be realized.

In the way of special telephone stunts, we have found is necessary in very noisy places—shops, engine houses, etc., where the six-inch gong could not be heard, to install air whistles connected by a trigger device to the telephone bell box, so that when the air whistle is set off it blows until the call is answered and trigger reset.

Naturally, the great bulk of communication between local offices should be and is handled by telephone, for speech has always been and forever will be the perfect means of transmitting human intelligence, and that medium is best which will convey it instantaneously with appropriate voice inflections from the person speaking, direct to the ear of the party for whom the information is intended. In business transactions, a written record is essential for both parties. This feature is almost the only obstacle in the way of using the telephone exclusively for local messages and it is rapidly being overcome through the realization of benefits to be derived from more excellent telephone service and facilities.

Telautographs are used to very good advantage, both at the Union station and Washington avenue new station, where train announcements must be displayed for some time and a permanent record is desired. One transmitter at the principal interlocking tower, Union station, sends simultaneously to six receiving machines in the facsimile handwriting of the operator, itemized reports of trains arriving, trains departing, cars set into the station, etc. Another transmitter in the telegraph office nearest Washington avenue station writes on two receivers in the station all reports of how inbound trains will arrive and the time that outbound trains pass the first towers on each the Eads and Merchants routes.

Operating Rules in New England

Telephone operators in New England are jubilant over the outcome of certain negotiations which have been pending for the last month between President Keller of the New England Telephone Company and a committee of operators who have approached him with a list of conditions demanding improvement, and which have resulted in the granting of the operators' demands on every question brought up for discussion. An eight-hour day, two weeks' vacation with pay, total abolition of "split tricks" for the older employees, and provisions for overtime pay are the principal reforms included in the list. The girls are well satisfied with the manner in which the company has received their demands, as the greatest courtesy and consideration have been shown throughout. The findings apply to the entire territory controlled by the New England Telephone Company.

The findings and directions are in effect:

A working day of eight hours for operators, to become effective not later than January 1, 1913.

No operator to be assigned to "split tricks" after 18 months of service, except upon request.

By July 1, 1913, a readjustment of hours and wages to make this noncompulsory "split trick" service more attractive, until such readjustment all "split-trick" assignments shall include an allowance of carfare covering one round trip from the central office to the operator's home.

Five minutes or more beyond any working trick shall be regarded as overtime and paid for at overtime rates, any such period up to 30 minutes counting as a half-hour overtime, and "time off" in lieu of such overtime not to be permitted.

The rule providing for 15 minutes' rest in all working periods of more than three hours shall be strictly enforced.

Finally, that the right of appeal is restated so that any operator feeling aggrieved may bring the matter to successive superiors, even if the appeal must come to the president.

Several weeks ago the company put into execution a two weeks' vacation system with pay, instead of 10 days, and also provided that all Sunday and overtime work shall be paid for at the same rate as overtime work, that is, at the rate of time and a half.

Announcement will be made July 1 from the local headquarters of the new pension system established by the company.

Kansas Commission News

The Kansas Public Utilities Commission has granted to the Kansas Central Telephone Company permission to do business as a public utility and to issue $36,000 in stock. The Kansas Central was also granted permission to purchase the exchange of the Plainville Telephone Company with toll lines to Palco, a line half the way to Hays and a line to Lincoln Center. It was also given permission to purchase from the Salina Telephone Company a toll line running from Lincoln through Vesper, Sylvan Grove, Lucas, Luray, Waldo, Paradise, Natoma and Codell to Plainville.

The Parker Telephone Company was given permission by the commission to increase its switching charges for country lines from $2.00 to $3.00 a month.

Seven Year Old Operator

Although only seven years old, Elizabeth Titcomb is expert at the telephone exchange in Clovis, Cal., and often relieves her father on the board, which has 250 subscribers. Elizabeth learned to be an operator by watching her father manipulate the board while she was compelled to stay indoors because of an epidemic.

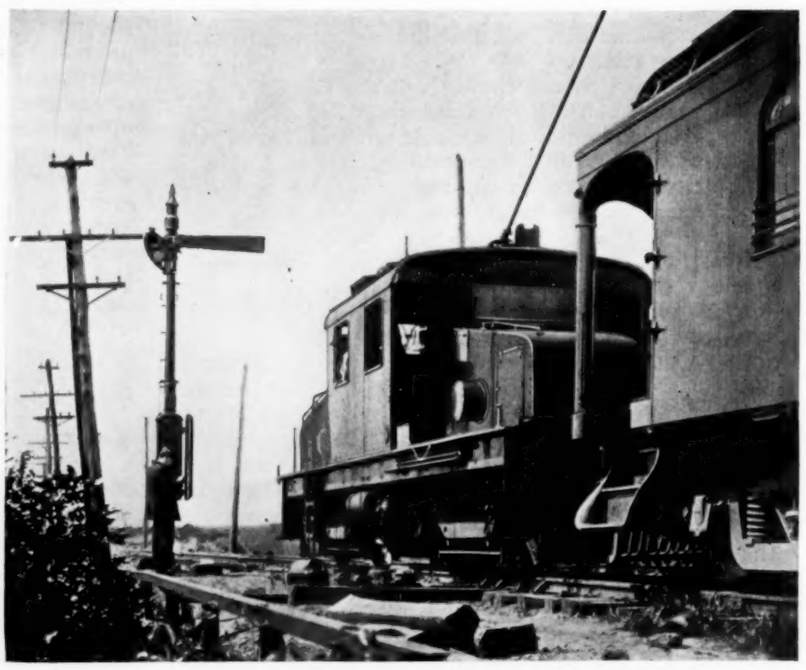
Equipment of Piedmont and Northern Lines

Modern Electric Road Installation

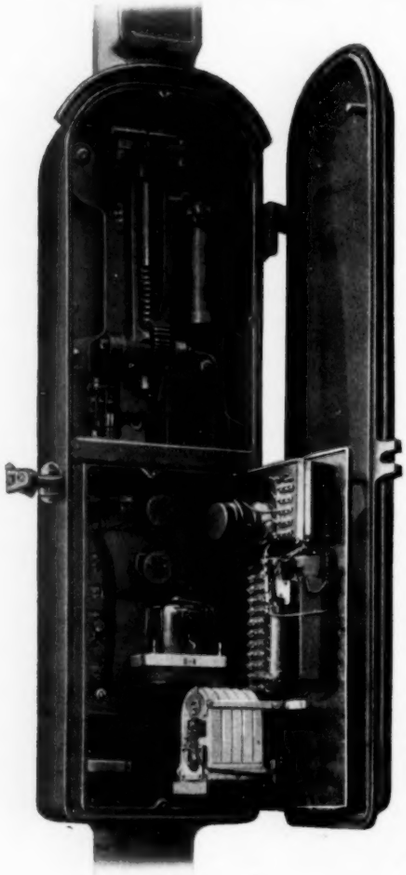
A TELEPHONE and signal installation of peculiar interest to both steam and electric railroad operating men has recently been completed on the Piedmont Traction Company's system, a portion of the Piedmont & Northern Lines. This is a large electric railroad installation in the Carolinas on which the equipment throughout is most modern in every way.

The initial installation covers 23½ miles of road extending from Gastonia to Charlotte, N. C. The trolley voltage is 1,500 d. c. and high speed trains are operated over this line. Some are of the multiple unit type and others are drawn by electric locomotives. The latter make a speed of 70 miles per hour.

With a road of this character an effective signalling system is, of course, a necessity and the Piedmont & Northern Lines settled upon a telephone dispatching system in conjunction with which are used selectively operated semaphores each of which contains a telephone set. This apparatus is of the latest type and has been put upon the market by the Western Electric Company, which has been a pioneer in the development of railroad dispatching systems.



Conductor Using Telephone, Piedmont & Northern Lines.



Telephone Casing Open.

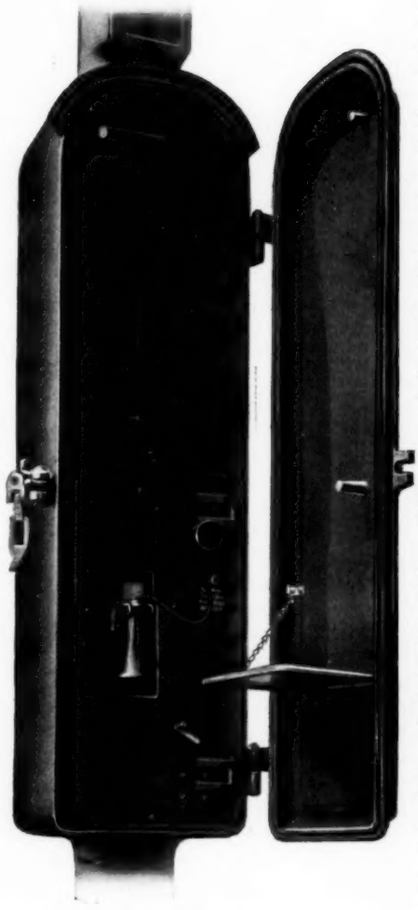
The telephone line is strung along the right-of-way and consists of No. 9 B. & S. hard drawn copper wire weighing 210 pounds to the mile. On this line seven regular telephone and selector stations are located and the transmission is excellent.

The interesting feature, however, of the installation is the semaphore equipment. Eight of these semaphores are placed at intervals along the road and are under the direct control of the dispatcher. He is thus enabled to stop a train and give orders direct to the crew at these points.

The semaphore is of the standard type. The Piedmont Traction is a single track road, and, therefore, the blades are equipped with front and back light castings so that the signals can be used in both directions. A casting is provided in the pole itself within which is installed the signal mechanism and the telephone and selector equipment. The signal mechanism consists of the ordinary electric slot manually restored. The only part of this which projects beyond the inner door, is the handle by means of which the conductor restores the blade to the "clear" position.

Below the signal mechanism the telephone equipment is installed and, as will be observed, none of this appears on the front of the inner door except the transmitter, receiver and generator handle. All of the other apparatus is mounted in the inner casing thus protecting it from the weather.

In addition to the telephone set, a selector is provided inside the casting enabling the dispatcher to control the operation of the semaphore blade. This selector is bridged directly across the telephone circuit and when the dispatcher wishes to throw any particular semaphore to the "stop" position, he operates a selector key. This sends out a number of direct current impulses upon the line which operates a particular selector and no other; in other words, the dispatcher can call any station upon his telephone cir-



Telephone in Casing.

cuit without calling any station other than the one desired.

When the selector in any one semaphore operates, it closes a circuit which bridges the semaphore slot magnet across the telephone line, thus furnishing current to this piece of apparatus and energizing it. This, in turn, operates the semaphore. It will thus be seen that no local battery is required at the semaphore stations, all the current necessary being furnished from the signaling battery at the dispatcher's office.

When the semaphore blade reaches a position approximately within five degrees of the horizontal, it trips a special mechanism, and sends back on the line a so-called "answer-back" signal; in other words, a distinctive buzz which informs the dispatcher that that particular semaphore has moved to the "stop" position. The train approaching the signal is, of course, stopped and the conductor receives his orders from the dispatcher and then clears the signal for future use. A writing shelf is provided on the inside of the outer door. The outer door is provided with a waterproof gasket so that the whole casting is rendered weatherproof.

The apparatus is wholly self-contained. The semaphore selector and telephone equipment are all mounted on the same iron post. The weather-proof box is locked so that access is possible only by means of keys. All the telephone apparatus is weatherproofed to withstand moisture, and all the woodwork on the inside of the set is oil treated. The wiring and design of the apparatus conform to the best signal practice throughout. All terminals are equipped with screws or hexagonal lock nuts and are arranged as conveniently as possible for maintenance purposes.

The Western Electric selector which is used for operating the semaphore mechanism is well known. It is in operation today on a great many of the largest railroad systems in the country, and is giving universal satisfaction. Its margins of operation are very wide, thus insuring reliability of action under the most severe weather conditions. Its current consumption is a minimum.

The semaphore as illustrated here is of special interest since it is applicable not only to an electric railroad system like the Piedmont & Northern lines, but also to a standard steam railroad where it can be used to the greatest advantage as an auxiliary train order signal in connection with the regular telephone train dispatching system. On divisions of the road where the night traffic is light this system can be employed to advantage as a supplement to the day operators as it supplies a means for the dispatcher to get in touch with the train crew whenever necessary although no operator is in attendance.

In addition to the equipment which has been described above on the lines of the Piedmont Traction Company, the Western Electric Company is also furnishing 15 more semaphore equipments and 12 regular selector stations for the Greenville, Spartanburg & Anderson Railroad, which is also a portion of the Piedmont & Northern lines. A part of this order has just been received and is the result of the successful operation of these signals on the road already equipped.

Wisconsin Commission News

The Mineral Point Telephone Company applied to the Wisconsin Commission for permission to increase its switching charge from $1.50 per telephone per month to $6.00 per month. After thorough investigation an increase of 50 cents per telephone per month was permitted as it was found this increase would be sufficient to meet the present demands. The commission also authorized the company to refuse connection at its switchboard to rural lines not connected, except in the case of full metallic lines having no more than ten subscribers. The Mineral Point exchange supplies switching service to twenty rural lines, nearly all of which have ground return. Owing to the overloading of the rural lines which were grounded, while the city system is metallic, the service was not satisfactory.

Oklahoma Commission News

The Pioneer Telephone Company has raised its rates to subscribers in Guthie 25 cents for each quarter mile beyond the first mile. This is the rate in force in all of its Oklahoma exchanges with the exception of Oklahoma City, Muskogee, Tulsa and Enid, where the extra charge is made for each half-mile beyond the first mile. Through a case filed by E. S. Lowther, of Guthrie, the Public Service Commission will make a general test of the legality of the company's action in establishing unusual rates, claiming that the company has no right to discriminate between its patrons in the same city, but must give all the same rate.

Maryland Commission News

The Baltimore Protective Telephone Association is planning to appeal to the Maryland Public Service Commission in its efforts to secure readjustment of telephone rates in Baltimore. A circular letter has been addressed to all the members of the association showing rates in other large cities which have unlimited service and an effort will be made to have the unlimited service restored in the business section of the city.

How Telephones Helped the Santa Fe

By L. M. Jones*

MY first thought was that this subject should be divided into two distinct parts; one giving in detail the arguments for, the other those against, the telephone dispatching system. However, we find so few objections (in fact only one) I have decided it will be best to mention the objection first, then go into the details, outlining its advantages.

The only objection which has been brought to my notice is the use of the headband receiver, which it is necessary for the dispatcher to wear constantly for eight hours daily. The pressure of the band and its weight, with that of the receiver, in time becomes annoying. The hard rubber shell of the receiver cap makes a heavy pressure upon parts of the ear; the soft rubber cushion, if used, relieves this trouble to a considerable extent, but in warm weather causes considerable perspiration and consequent uncomfortable feeling. Here, it seems to me, is the largest field for improvement. We should, in my opinion, have a transmitter sufficiently powerful to permit placing a receiver in such a position that the dispatcher may hear equally as well by placing his ear near it and in this way avoid the necessity for the use of the headband receiver. We have all noticed operators along the line wearing the receiver head band while engaged upon other work, which is done for the purpose of keeping in touch with train movements. In this respect we must admit an advantage in favor of the telegraph over the telephone method.

The first advantage of the telephone, and one that is noticeable as soon as a circuit is placed in service, is the time saved in calling offices for the purpose of putting out orders. An operator having outside duties, such as delivery of freight, baggage, or express, etc., has his attention immediately called to the fact that he is wanted by the ringing of his bell, while by telegraph he is called until he happens to come into the office; in the meantime, though only five minutes may have elapsed, this may have made the combination the dispatcher had in mind valueless, and the setback this train has received may result in its having a number of other bad delays during the day. On the other hand, when the telephone bell rings, it brings the operator immediately, and the time saved in calling offices may always be used by the trick dispatcher to a good advantage.

In getting information from all offices, a weather report, for example, may be secured from twenty offices in less than five minutes. By telegraph, it would probably take twenty minutes and be closed with possibly one-fourth of the offices failing to respond. It is not unusual for the dispatcher to be called upon by a relay or Western Union office to ring an office for which they have a rush message and are unable to raise the office promptly by telegraph, and this can be done with practically no effort as compared with calling by telegraph.

In transmitting orders by telegraph the rate of speed is governed by the ability of the poorest operator on the circuit, while by telephone the ability of all operators to copy being about on a par, the speed is regulated by the dispatcher who writes the order in his book at the time it is sent to offices. While some time is saved in transmission, probably 25 per cent, by far the greatest saving is made in repeating the order back to the dispatcher. The order being written in the book by the dispatcher as transmitted, it may be repeated back at about the rate of ordinary conversation, or in approximately one-fourth the time required for telegraph repetition.

The consensus of opinion is that the telephone increases the efficiency of the train dispatcher at least 25 per cent; in fact, some insist that everything considered, 50 per cent is nearer correct. In some cases it may be possible to lengthen dispatchers' districts and possibly get along with fewer dispatchers.

Under the telegraph system, the dispatcher copies the order in his book as it is first repeated, sending the order with a written copy for reference. By the telephone system, the order is written in his book as it is transmitted to the offices interested, so that the repetition by operators is checked directly against his copy book, rather than his memory, any error being detected immediately.

In cases of washouts, broken rails, etc., when reported to the dispatcher, he looks at his clock and notes a train may be very near the last station. Instead of calling desperately and hoping he may have the good fortune to find the operator on hand, it is only necessary to make one turn of the wrist and a bell is ringing which will bring the operator if within a block of the office. This conserves the strength of the dispatcher and relieves him of an immense nervous strain; in fact the benefits and safeguards are so numerous this one is only mentioned as an example.

Without a doubt many wrecks in the past could have been prevented for the reason that when oversights have been made by dispatchers, or operators have failed to deliver orders, there has often been a chance to hold a train at an intermediate office when the error was discovered, provided the operator had answered his call promptly, the element of time being the factor. Probably the operator getting his baggage or mail ready for a passenger train, or possibly asleep and being awakened by the passing train, answered his call too late, while a selector bell would have caused an immediate response. Under the telegraph operation when derailments occur between stations, blocking the track for hours possibly, a lineman must go there to cut in a temporary office; an operator is also necessary—with the usual delays attending such movements—then the lineman must go back to cut the temporary office out when the wreck is cleared. This is not necessary when we have a telephone circuit; a portable telephone set with the usual connecting line pole is all that is required, thus saving the time of a lineman and an operator. When derailments occur now, the conductor comes to the nearest telephone and talks with the trick or chief dispatcher, tells him the exact conditions, cause, etc., and also advises regarding material necessary to repair track, giving the division officers the details first hand. Many trainmen, for example, can describe conditions perfectly in this manner, but if required to place their reports in message form would omit many essential details.

I will cite one case on our line as an example. A train

*Paper presented at the annual convention of the Association of Railway Telegraph Superintendents, New York, June 4, 1912.

with fifty cars cut off an engine and started in on a spur to pick up two cars. A rail was broken, derailing a large engine. Conductor reported to the dispatcher as follows: "In heading on spur 'B' rail broke; engine is on ground, our train is on main line. Send engine to pull us out; she must come from the east and first pull the fifty cars back to 'C' and place on siding; this will clear the main line. Have section men working now and as soon as we are rerailed everything will be clear"—all of which took about a minute.

In case of a blockade in a yard, the trick or chief dispatcher is able to secure more actual information by talking with the yardmaster over the telephone a few minutes, than by sending any number of messages, often resulting in reducing train service and at the same time increasing the efficiency of the service.

If there is any situation a dispatcher does not understand, it is easy to obtain all the facts by telephone; as compared with the telegraph, there is no way of accurately comparing the saving in time. This is particularly true in case of accidents. By talking with agents, the trick dispatcher saves a great many messages daily which it would otherwise be necessary to send regarding cars required for loading, etc.; in fact a conservative estimate would place the saving at an amount at least equal to one operator in each division office.

We have a fast mail train which arrives at destination on the dot twenty-nine days out of thirty, but to secure this result it must leave the terminal on time, regardless of its connection from the west. However, if the connection from the west is over an hour late, it misses the regular train and is run through, making an extra train for over five hundred miles. This is what happened recently. Train from the west was fifty minutes late; general superintendent's office asked the trick dispatcher about this train, to which he replied: "Fifty minutes late, twelve cars, no extra stops, two cars to pick up at 'K,' big crowd to get on at 'W'; will probably make schedule." Instructions were then given as follows: "Maintain schedule if possible; if unable to do this will have to run two sections east. Find out from conductor at first stop if people in the two special cars are equipped to prepare their own food; if not it will be necessary to carry diner east." The dispatcher secured the information, rang the general superintendent's bell and advised him a little later that everything was lined up and the train would make the connections, all of which consumed very little time.

On two of our desert divisions, where telegraph offices are some distance apart, all blind sidings are equipped with iron box sets. When conductors have reason to believe they may get help, they ask the dispatcher and long delays are often prevented in this manner. Some of our night trains on branch lines are equipped with portable sets which are used in emergencies, often greatly facilitating the movement of trains.

We probably derive greater benefits, so far as actual saving of money is concerned, by the use of portable sets. From those furnished work trains, extra gangs distributing, laying and picking up rail, etc., between the stations, as compared with the old method, it is estimated that the same number of men in a gang will be able to do one-third more work if equipped with a portable set than under the old system of protection.

The telephone circuit is not affected by fogs, while the telegraph is often rendered inoperative where lines parallel the coast. Prior to the use of the telephone we had two Pacific Coast and one Gulf Coast circuits, which gave us so much trouble in the early days that one of my predecessors endeavored to overcome the trouble by stringing insulated wire for a considerable distance, without result. The telephone solved this question for us; in fact, the more fog we have the better it works. We find our telephone circuits often work when all telegraph wires on the pole line have failed during storms.

We all know of the troubles in wet weather, especially at night during fogs, due to the relays at way stations getting out of adjustment, dispatchers calling offices sometimes intermittently for half an hour or more, then often resorting to the old custom of having a nearby station call for him, finally raising the operator in this way, and having him adjust for the dispatcher. This does not happen with the telephone, for with it there are no adjustments due to weather conditions required.

The results due to harmony of forces cannot be overestimated. From everywhere you hear this emphasized. Instead of the contention for circuit and discord between the dispatchers and operators, the dispatcher is brought in much closer touch with the operators and agents. All petty quarrels, such as frequently occur by telegraph, are entirely eliminated for the reason that they are usually due to a misunderstanding. It is so easy to explain such things fully by telephone that they are in this way obviated; in fact, they are one happy family.

The telephone harmonizes the whole force, and as a consequence, in every way facilitates the handling of business. It has made it possible for the dispatcher to keep agents posted accurately regarding the arrival of trains, thereby bringing the traveling public and the company closer together.

Some of our superintendents and trainmasters are not telegraph operators. The telephone has made it possible for them to get information of all kinds from agents, operators and trainmen on the line first-handed, instead of through a third party, as was necessary before we had telephones.

At first dispatchers, except those having trouble due to operators' paralysis, are almost to a man more or less opposed to the use of the telephone. After using it a short time, however, they consider it a hardship to have to go back to the telegraph even for an hour or so in an emergency. In giving an opinion, one dispatcher says: "With the inauguration of the telephone train dispatching system, the company made another rapid stride toward perfecting its service; and, perhaps without an exception in any single feature, never has an improvement been made which so expedites the handling of the volume of business and at the same time surrounds its every movement with such an additional factor of safety. The benefits from a safety standpoint are unparalleled in the history of train dispatching."

About a year ago our dispatchers were given an increase in salary. In acknowledging receipt, one said he really felt ashamed to take the money for the reason that never in his twenty years' experience had he found his work so easy, which he attributed to be due to telephone train dispatching and the use of oil burning engines.

The Chicago Telephone Company is credited with the statement that there are 596 Bell telephone circuits radiating from Chicago. Of this number fifty are to Milwaukee and there are also direct circuits to New York, Boston, Washington, Denver, New Orleans and other distant cities

Tests on Insulator Eucalyptus Pins

A great deal of attention has recently been focused on the planting and growing of eucalyptus in California, says the *Journal of Electricity, Power and Gas* of San Francisco. Many companies have been organized, much capital has been invested, and the large acreage already planted is being rapidly increased. The Forest Service has sought to aid eucalyptus growers by publishing such information concerning the tree and its uses as it could secure after careful study, and in circular 179 of the Forest Service may be found much valuable data.

The eucalyptus is a native of Australia and the adjacent islands, where some 150 varieties are found. It was introduced in California in 1856, when it was planted around San Francisco Bay for ornamental purposes. During the next few years it was planted in the Santa Clara Valley for wind-breaks. Since 1865 the eucalyptus have been extensively planted in California, mainly for wind-break purposes around orchards and vineyards, and also for fuel. The extensive planting operations of the past four or five years have been taken up with the idea of furnishing not only fuel, but also telegraph poles, piling, and lumber large enough to make vehicle and carriage stock and furniture material.

About 75 species of eucalyptus have been grown in California. The blue gum was the first species introduced into the State, and has been much more extensively planted than the others. Probably 90 per cent of the eucalyptus in California at the present time is blue gum. Of the many other species introduced, red gum, sugar gum, gray gum and manna gum make up by far the greater part. These five give indications of being well adapted to California conditions, although, of course, others may be found which will give just as satisfactory results.

As a rule, blue gum grows erect; it branches low in isolated specimens, but in close plantings the crowns are small and the lower trunks fairly clean. It reaches its greatest development along the coast and in river bottoms where foggy days are common and the annual rainfall is at least 15 inches. The species when grown under favorable conditions ranks among the fastest growing trees of the world. The wood is yellowish white and easily polished.

A combination of the results of the tests on green blue gum gives, in the bending tests, in an average fiber stress at the elastic limit of 6,907 pounds per square inch; an average modulus of rupture of 11,800 pounds per square inch; an average modulus of elasticity of 1,788,000 pounds per square inch; and an average elastic resilience (shock-resisting ability) of 1.58 inch-pounds per cubic inch. The average crushing strength parallel to grain is 4,919 pounds per square inch; the average strength perpendicular to the grain at the elasitc limit is 1,329 pounds per square inch; and the average shearing strength 1,625 pounds per square inch. In the air-dry material the strength is increased except in compression perpendicular to the grain.

In a series of tests on hickory, now under way by the Forest Service, the average modulus of rupture of several kinds in a green condition, including pignut, shagbark, mockernut, big shellbark, nutmeg, and water hickory, runs from 9,200 pounds per square inch for nutmeg hickory which is considered an inferior variety, to 11,450 pounds per square inch for pignut. For comparison with these figures, blue gum has an average modulus of rupture for green material of 11,800 pounds per square inch, or slightly larger than for pignut hickory. The dry weight per cubic foot of blue gum is about 49 pounds. The average weight of oven-dry pignut hickory is about 51 pounds per cubic foot.

Let us next analyze the results of tests on the four eucalyptus, red gum, sugar gum, gray gum and manna gum. Green sugar gum has strength values considerably above the other species. It has an average bending strength of 16,480 pounds per square inch and an average crushing strength of 7,215 pounds per square inch. Red gum comes next in strength, with an average modulus of rupture of 12,570 pounds per square inch and an average crushing strength of 6,047 pounds per square inch. Manna gum shows the lowest strength values of the four species. Gray gum occupies an intermediate position in regard to strength.

Enough has been done to indicate that some species of eucalyptus grown in California may prove excellent substitutes for woods in use at present for cord wood, piling, posts, poles, cross-ties, mine timbers, paving blocks, insulator pins, furniture, finish, veneer, cooperage, vehicle stock, and tool handles.

The value of eucalyptus, particularly blue gum, for insulator pins, has been thoroughly demonstrated. Eucalyptus pins have been used extensively in California and have been shipped to Canada and the eastern states. After fifteen years' service, sound pins are still in use.

In April, 1909, arrangements were made by the Forest Service with the Pacific Telephone & Telegraph Company to have eight eucalyptus globulus and eight tanbark oak cross-arms placed in the company's lines in San Francisco. They were originally 8-pin arms, but when set in the line only six pins were used, the two pin holes nearest the pole, upon either side, being left vacant. None of these arms were painted, although the standard arms were at that time protected in this way. The company does not now paint its standard arms. The arms were equipped with eucalyptus and tanbark oak pins, except in the case of one arm, in which standard pins were set. Both arms and pins were cut from planks which were air-seasoned at the Berkeley Laboratory for almost two years. The arms were manufactured at the laboratory and the pins at San Jose. The experimental material was set in the line on September 8, 1909.

The pins were inspected Nov. 7, 1901, and the following conclusions were drawn: The non-insulated tanbark oak pins were found in fair shape, but those of the non-insulated eucalyptus pins were in better condition. The insulated eucalyptus pins were found to be in excellent conditio nand in better shape than the others inspected, while the standard oak pins, both insulated and non-insulated, were in poor condition.

Those who like to know what others think of apparatus before they buy for themselves would be interested in a testimonial letter from the superintendent of telegraph of the New York, New Haven and Hartford Railroad Company to the Thompson-Levering Company. The railroad is using Peerless testing sets and, judging by the letter, is delighted with them.

Main Line Relays in Selector Operation

By W. W. Ryder*

IN the early development of the selector in telephone train dispatching work, a main line relay was used to receive the signals, the selector mechanism being operated off the local points of the relay. Later several types of selectors were brought out in which the signaling current directly actuated the step-up mechanism.

While this arrangement reduced the number of parts in the selector and its cost as well, it also reduced its effectiveness. The moving parts of the directly operated selector has a greater inertia than the light armature of the relay, and a much greater current was required to satisfactorily operate it; then too, the margin of operation was considerably lessened, varying with the different types.

Attention was first drawn to this matter about a year ago when installing a dispatching circuit on the Michigan Central "cutoff" between Jackson and Niles. The dispatching circuit over the old road between these two points was equipped with selectors of the relay type with local stepup operation, while the "cutoff" circuit was equipped with those of the directly operated type.

Both circuits terminating in the same dispatcher's office afforded a good opportunity to compare details of operation, and it soon developed that the new selectors were not nearly as satisfactory as the older type, this being particularly noticeable when there was a considerable change in the volume of signaling current by reason of offices cutting out at night and in again in the morning, the operating range of the selectors not being wide enough to work successfully on the varying current.

This trouble was so serious it became necessary to issue instructions that offices must not cut out when closing for the night. As this trouble had not been experienced with the older selectors, it was evident that the cure lay in the introduction of a sensitive relay in the circuit, particularly as the similarity between the selector circuit and the ordinary Morse telegraph circuit was so clearly apparent. Accordingly arrangements were made with the manufacturers of two different types of selectors to furnish some of their apparatus equipped with relays, and while some experimenting has since been done in varying the relay resistances, the results in every instance have been greatly improved; in fact, the change has been so marked it has been decided on all New York Central lines west of Buffalo to replace all those not so equipped with main line relay selectors.

This involves some additional expense both in the increased cost of the equipment and labor expense of making the change, but this expense is clearly justified—first by reason of the greatly improved service, and second, because of greater economy of operation.

Contrast for a moment the amount of current required by the two types of selectors: In the installation of the direct operating selectors at least six milliamperes of current must be furnished per selector and effectively distributed. The usual specifications call for ten milliamperes to provide sufficient margin for battery deterioration, the maximum current range being between six and fifteen milliamperes.

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The local battery selector being operated through the medium of a very sensitive high wound (4,700 to 7,000 ohms) main line relay, with very light armature, requires only a light retractile spring tension, and is consequently very quick acting on a minimum current. These relays only require four milliamperes, and will operate without readjustment on from one-half milliampere to eighteen milliamperes, thus insuring satisfactory operation under practically all conditions. Line changes due to varying weather conditions also have a much smaller influence on this type, which is an extremely important feature.

This lessened current requirement means cutting the voltage of the signal battery in half at least, with all the naturally attendant benefits of lessened leakage, etc., while the widened margin of operations means less failures, thus avoiding many trips of the inspectors for the purpose of adjusting selectors reported as failing to operate. It also means longer circuits, and more stations can be successfully operated than is otherwise possible.

It is true with the relay selector, the local battery is required to do double duty, that is, to operate the selector mechanism as well as to furnish current for operating the vibrating bell. This increases battery consumption in the local circuit to some extent, figures showing the average life now to be five instead of seven months. However, this increase in local nowhere near offsets the saving through reduction in main signaling battery.

Reducing the signal battery has made it possible to do away with extra equipment, such as retardation coils and expensive high voltage condensers at the dispatcher's terminal. It also lessens the original installation cost, has practically eliminated trouble of breaking down condensers, and has minimized possible injury to dispatchers.

The following actual figures illustrate the comparative merits of the two types of selectors mentioned: A dispatcher's circuit 183 miles long has 26 stations equipped with direct operated type of selector. This circuit requires 398 volts, and a current of 310 milliamperes. A paralleling circuit between the same points used for message service has 43 stations equipped with relay selectors. This circuit requires 150 volts and a current of 172 milliamperes. Thus the latter circuit with 17 more stations than are on the dispatcher's line, is actually worked with 248 volts and 138 milliamperes less than is required to operate the dispatcher's line. Not only this, but the general service has been infinitely better, and this through a period of about one year.

Another pair of circuits are 143 miles long. The dispatcher's line has 30 offices equipped with old selectors, and requires 350 volts and 320 milliamperes of current. The message circuit with 32 offices equipped with relay selectors is worked with 135 volts and 135 milliamperes, a reduction of 215 volts and 185 milliamperes.

We just received an order from an advertisement which appeared six years ago in a monthly paper. The same "ad" in a weekly would have been dead five years, eleven months and twenty-three days.

Michigan Commission News

In an opinion handed down June 20 the Michigan State Railroad Commission renders an important decision relative to the relations between telephone companies and their subscribers, and announces that the public service corporations must not discriminate between its patrons by requiring some to sign contracts while allowing others to rent telephones without signing. The commission also discusses the provisions of these contracts and points out the reasonableness of the provisions.

The case at issue was that of W. L. Jones vs. the Cass County Home Telephone Company. The company bought the system in 1907 when there were 300 subscribers. Since then 300 subscribers have been added. The old subscribers had never signed contracts, but the new ones were required to do so. Jones was one of the old subscribers and there having some friction arisen between him and the company, the latter demanded that Jones execute a contract. This he refused to do and his service was cut off, whereupon he offered to pay in advance, but he was refused service except he would sign a contract. Jones then brought the matter before the commission.

In the decision, which was written by Commissioner L. T. Hemans, it is said:

A telephone company may adopt the reasonable regulations helpful to the discharge of its public duty, but it cannot within the law impose these regulations according to its caprice; it cannot provide discounts for its friends and impose penalties upon those who incur its displeasures. It follows that it may not have one set of regulations for which it demands punctual observance from one set of subscribers and from which it entirely excuses another.

It is essential to the orderly conduct of the telephone business and the satisfaction of public demands that regulations be established that insure equality of service for numerous patrons. The public has an interest in the certainty and promptness with which a company collects its tolls and rentals for prompt collections bear an intimate relation to both efficiency and cost of service. Regulations which promote these important considerations are enforced by the courts and will be followed by this commission.

The commission points to court decisions upholding the right of public service corporations to allow a discount for prompt payment of rentals, as well as of the requirement that rentals shall be paid in advance. Relative to the discount, the commission holds that while the discount is a negligible factor in the company's revenue, it is a most important factor in securing prompt payment and "preventing loss that would otherwise have to be met from earnings and ultimately through public contribution. We believe that this feature of the contract can be justified as a reasonable regulation and therefore should be sustained. Approval is also given to the provision in contracts which requires the patron to agree to keep the telephone for a year.

Another feature of the contract discussed relates to that under which the company retains the right to change the subscriber's number at any time. The complainant had raised the point against this provision that to a business man a telephone number comes in time to have an element of value, and he should not be deprived of it. The commission agrees with the companies, however, that numbers are used in the interest of efficient operation and that owing to constantly changing conditions it sometimes becomes necessary to change numbers. Another action which the commission approves is that which makes the subscriber responsible for all long distance messages originating from the telephone leased by him. Admitting that this feature is the cause of considerable contention between the company and patrons, the commission says the subscriber is by far the best situated to know the use to which his telephone is put and can protect himself against imposition while the company has no such opportunity. To adopt any other regulation, it is pointed out, would result in making payment for long distance service dependent upon the honor of the subscriber. The company in this case is criticised, however, because the commission says that discrimination has been practiced. In conclusion, it is stated that the commission can only order discrimination to be removed, adding that upon the removal of discrimination, exchange service will be furnished to the complainant upon the same terms and under the same conditions as service is furnished to other subscribers similarly situated.

Telephone Nuisance in Battle Creek

The druggists of Battle Creek, Mich., are considering the drafting of a universal regulation to be placed on telephones limiting talks to two minutes. The conversational marathons are becoming even longer than they have been, which didn't seem possible.

"Of course I can't run the risk of offending a patron," one druggist said, "but I wish that some kind of a rule could be made to absolutely limit conversation. It is getting so that we can never use the telephone ourselves and if patrons wish to order anything they have to send a messenger. But I can't say anything."

Other druggists are not so polite. One has a sign which reads:

"Talk business over this telephone. If you want to visit take a street car."

Does the sign offend? Hardly. It hadn't been up more than two days before it was scribbled on by a man who was making a date with some fair young thing.

The telephone pest has a habit of writing while talking. One drug store sustained quite a loss a couple of months ago when telephone users put down numbers all over two or three expensive calenders with an indelible pencil.

"It's a nuisance," one clerk declared. "I was in the back of the store putting up a prescription. It took so much of this stuff and so much of that dope. I was about half through when a woman came in. I walked to the front of the store, trying to remember how much powder I had mixed.

"I only wanted to use the telephone," she said.

I went back and I'd forgotten how much dope I'd used. So I started the prescription again.

"I can't find the book," she complained.

I went forward again. I found it on the floor where the previous telephone patron had left it. Then I went back and found out I'd forgotten what I'd done with the prescription. Just about the time I found it the woman called me again.

"Will you please do me a favor," she said. "Call up this number. It's his office and I don't want the men to know I'm calling him."

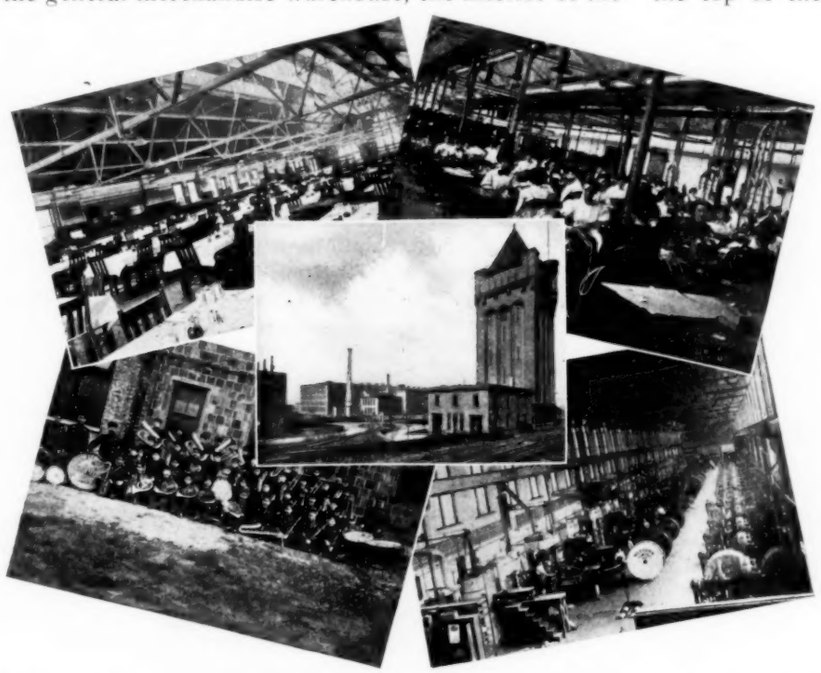
I did as requested, but I didn't go back again to fill that prescription until she had left.

Of Interest to the Trade

By A. L. Haase

Hawthorne on Post Cards

A series of intimate views of the Hawthorne works of the Western Electric Company has recently been arranged for post card use and is intended to give the company's friends a better idea of what the "Electrical Capital of America" really is and what is being done there, industrially and socially. The series consist of twelve views showing a general view of the works, the imposing water tower, the telephone apparatus shops, the general merchandise warehouse, the interior of the



lead press rooms in the cable plant, a view showing how cable cores are built up, a corner of the switchboard wiring department, the cord department, an electric motor truck in the warehouse, the brass band which makes good music as well as "quality apparatus," the lunch room with a seating capacity of 3,000, and one of the annual field day events of the athletic association.

The post cards are actual photographs and are remarkable for their clearness and fine detail. They will form a worthy addition to post card collections.

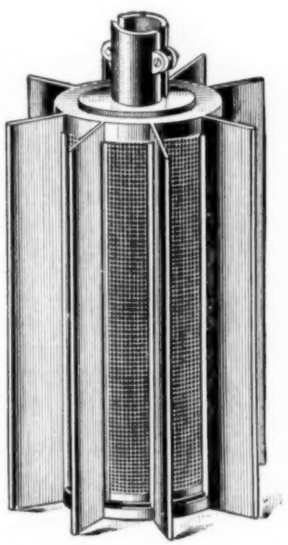
Grounding Device for Telephone Wires

The accompanying illustration shows a device known as the "Maxum" grounding box. This device has been designed to meet the most exacting requirements of electric light and telephone service. The construction embodies the salient features that have proven, from numerous tests, most effective in establishing an earth connection at once efficient and permanent in character.

The Maxum grounding box consists of a hollow cylindrical cast iron shell approximately five inches in diameter and twelve inches long. Supported by this shell, and forming part of the same casing, are a number of longitudinal ribs that extend radially outward from the circumference of the cylindrical surface.

The center of the box serves as a receptacle for holding a special hygroscopic compound of silicates, sodium, carbon, and vegetable fibre.

Connection to the ground box is made by means of a one-inch galvanized iron pipe that is screwed into the top of the casting and securely fastened to the



Maxum Grounding Box.

body of the casting by means of a suitable clamping lug.

The entire construction is heavily galvanized by the hot-dip process and eliminates any possible corrosion due to electrolytic action or oxidization of the exposed parts.

This particular design of the grounding device provides a surface of over 500 square inches, so that the current density per unit area for any given discharge is reduced to a very small amount. This feature is of particular importance where continuous or recurrent charges of long duration are experienced. (In cases where the current density is high, due to too small an area of contact surface, the heating effect is sufficient to rapidly drive off the electrolytic moisture that supports conduction; and this renders a ground inoperative.)

Tests made upon the Maxum grounding box have shown a very high ampere-hour capacity even under heavy discharge rates, without any apparent increase in resistance due to local heating.

Another point that has been given particular attention in this device is the method of supplying electrolytic moisture to the earth immediately surrounding

the ground connection. Practical tests have proven that in general all the resistance to current flow from an electrical conductor to the surrounding earth lies within a few inches of the grounding device. Further, since the transfer of current is principally by means of electrolytic conduction, the efficiency of any ground connection will be dependent upon the chemicals existing in the earth in intimate contact with the ground electrode and also upon the amount of moisture present.

In the Maxum ground the composition is exceedingly hygroscopic in nature and therefore not only tends to draw and retain a considerable amount of moisture, but also to supply to the strata of earth surrounding the outer surface, those chemicals most needed to support electrolytic conduction.

The permanency of the ground connection has also been carefully considered in the construction of this particular grounding device. Care has been taken to provide a mechanically strong pipe connection and rigid grounding element. The material of which the box is composed is cast iron and the extra heavy coat of galvanizing precludes any danger from corrosion due to the electrolytic action of the discharge currents. Local action, invariably present where dissimilar metals are exposed to a common electrolyte, and producing rapid deterioration of the metal parts, is also effectually guarded against.

In installing a ground care should be taken to select a moist soil if possible. Loamy soil is best suited for this purpose; clay or gravel beds should in general be avoided.

The Maxum ground should be sunk to a depth of five or six feet, depending on the nature of the soil and the connecting pipe added so as to bring the end twelve inches or more above the grade level. After tamping the earth thoroughly into the hold, if convenient pour as much water as possible into and around the pipe so as to thoroughly saturate the composition held in the ground box.

Connection between the circuit or piece of apparatus to be grounded and the ground pipe should be made preferably by means of an approved ground clamp.

In practice it has been found that several hours usually elapse before the ground shows an appreciable discharge capacity, and under certain conditions does not reach a maximum value for several days after installation, this latter condition existing where the soil is particularly dry and no water is poured amid the ground.

It is recommended that wherever possible, accurate records be kept of the resistance and ampere hour capacity of the ground connection, so that any change in condition due to external sources may be detected and corrected. This procedure is, of course, hardly practicable on line grounds, but for station work is highly desirable.

In large installations of electrical apparatus, where it is desirable to install a particularly heavy ground connection it has been found best to install several ground boxes about five feet or more apart and connected together by a common grounding bus.

The Maxum ground box has been placed on the market by the Fairmount Electric and Manufacturing Company, Philadelphia, Pa.

Test of the Mack Post Hole Digger

A test was made recently at Glassboro, N. J., of the Mack post hole digger No. 1. The digger left the Bell Telephone Company's offices, Seventeenth and Filbert streets, Philadelphia, with a driver and operator of the drill, at 7:10 Tuesday morning, May 21, arriving at the scene of operation at 8:45—a distance of twenty-five miles.

The first hole was dug and the pole set in place in 27 minutes; the second hole was dug and pole set in position in 30 minutes; the third hole was dug and pole set in 45 minutes; the fourth hole in the same time. The time of placing the third and fourth poles was just a little longer on account of getting the derrick and the pole in position under a string of thirty wires. The poles were 35 feet in height, and even this time was extremely short considering the fact that it was not necessary to take the wires down to place the new pole in position. The fifth and sixth holes were dug and the poles set in position in 25 minutes.

The gang for drilling the holes consisted of two men and the operator of the truck, and a total of five men were used to set the pole in position. Under the old plan it required one man one hour to dig the hole, and a gang of nine men and a foreman are used to raise the pole in position and set it. This, however, takes from fifteen minutes to a half hour longer, which makes a total of nine men one and a half hours to dig a hole and set pole in place.

The foreman of the gang informed the writer that one man can dig about ten holes a day; consequently ten poles can be set under ordinary conditions per day. With Mack post hole digger No. 1 two holes can be dug and two poles placed in position in one hour, making a total of twenty poles per day, and these holes are six feet 6 inches in depth, which requires practically six raisings of the drill to bring the dirt out of the holes and make ready for the poles.

Mr. Speh, supervisor of supplies for the Bell Telephone Company, stated that at the present time, with the gang already on the ground, in the old way, nine men and a foreman would cost approximately $42 per day to dig and set ten poles. In the new way the telephone company figures that it will cost, including the operating charges of the pole digger and the gang of men, about $18 a day to operate, setting twenty poles a day, which amount is practically one-third of the cost of the present method, besides doing just double the work.

A rather unusual feature of the day was a picture of telephoning from a Mack truck. The gang carry what they call a testing telephone which they use along the country roads to report to headquarters from time to time and secure orders for the next day. This telephone was set on the truck and a photograph taken of it while talking to the Glassboro operator, a distance of five miles away.

Those who attended the test were Mr. Cunningham, the superintendent of construction; Mr. Speh, supervisor of supplies; Mr. Frost, supervisor of supplies of the eastern district; Mr. Repp, supervisor of the Camden division; Mr. Mulligan, inspector of overhead wires and cables, and the representative of the Mack company, all of which were exceedingly pleased with the test.

More Western Electric Expansion

The Western Electric Company, on June 1, formally opened a large warehouse and branch office at Houston, Texas, in order to handle more effectively the growing business in the Gulf Coast. This move of the company is a recognition of Houston's superior position as a shipping point and a center for buyers of electrical goods. Several of the South's largest railroads enter the city, a fact which makes it possible to give excellent service to customers.

The new house will be operated as a branch of the Dallas organization under the supervision of R. W. Van Valkenburgh and Paul Joyslin, manager and sales manager, respectively. The local organization will have as its resident heads H. P. Hess, in charge of sales; F. G. Caldwell, in charge of store, and M. A. Schon, in charge of warehousing. Complete stocks of telephone, power, supply and line material will be carried.

Since the Western Electric Company established a resident sales force and a stock of merchandise at Buffalo, in 1910, it has become more and more impressed with the sales possibilities of that territory which can best be served from Buffalo. In order to facilitate the handling of the business of the customers in that territory, additions have been made to the sales and office forces and steps taken to increase the stocks.

Effective May 1, L. F. Philo was appointed sales manager at Buffalo and the administration is so arranged that all matters arising in connection with relations with the customers may be handled directly with the Buffalo organization.

With the increased facilities, both from a stock and service standpoint, the company feels confident that it can serve the interests of its customers to the best possible advantage.

S-C Advertising Suggestions

The Stromberg-Carlson Company of Rochester, N. Y., announces that it has forthcoming a series of advertising suggestions that will prove of big value to the small telephone exchange which is hustling for new subscribers.

Harry C. Slemin, the advertising manager of the Stromberg Company, who has been very successful in planning out sales campaigns and advertising literature for his big company, has been working very hard for several months, preparing suggestions for advertising copy which can be used by the local telephone company in their local newspapers and will have a large effect in obtaining new subscribers. Mr. Slemin intends to give any rural telephone company a complete set of these advertising suggestions and furnish him with cuts so that the telephone company is really enjoying the services of a high class advertising specialist at no cost. There is no question that this cooperation by the Stromberg company will assist any ambitious rural telephone company that obtains a set of these advertising suggestions.

Another of those beautiful little brochures that the Stromberg-Carlson Telephone Manufacturing Company has made famous is "Private Telephone Systems," all about intercommunicating telephone equipment. Write to Rochester for a copy.

A Matter of Courtesy

We were enjoying a brisk discussion—the Sage, the Doctor and I—in the cosy study of the first named, when the telephone bell rang. The host, as is his custom, laid down his cigar deliberately, crossed the room without haste and lifted the receiver to his ear. Then ensued a series of routine answers to trivial questions, all given in the quiet tone a mother employs when speaking to her child. We were hardly embarked on the interrupted conversational voyage when the bell rang again and the same scene took place. A third time the bell shrilled out its insistent call. Our host never raised his voice or betrayed the smallest sign of irritation. He resumed his chair and cigar without comment.

The Doctor twisted his head, as is his habit when broaching a new subject, carefully placed some ashes in a tray and glanced keenly at our host:

"How do you do it?"

"Do what?"

"How do you manage to keep your temper and answer all these nonsensical questions so patiently and pleasantly?"

"Simply because it is the only thing to do. A telephone call is part of a game in which there is only one way to win, by making a rigid rule to speak kindly to all who call you up.

"When you meet a friend, an acquaintance or an enemy on the street, you have some data to work on. Even a stranger gives some hint of his quality. But when the telephone bell rings you have nothing to work on. This leaves an element of risk so large that I wish to avoid if I can. There is but one way to be safe and I take it.

"Suppose our inquirers are merely fussy and inconsiderate and disturb you with no reason worth mentioning. These are just the people who take offense most easily. I cannot make them over, but I can avoid hurting their feelings and probably making personal enemies of them.

"You remark these bothersome calls because they break up our conversation. Those who call never stopped to think of that. It never occurred to them that the bell is ringing all day long. But they are certain to feel that you owe them kind attention.

"The majority who call me up are unhappy or bothered or vexed about something. Unless I am careful I shall render these conditions worse. On the other hand, I find it takes very little trouble to put them in a better frame of mind. It is worth while. Your inquirer like yourself relies mainly on the tone of your voice and your manner as you do on his. Hence you have the dilemma—to do some good or an amount of harm that you cannot measure.

"The French have an axiom 'Nobility obliges.' I think good fortune obliges too. We three have been rather fortunate as the world goes. We can afford a little extra consideration for those who have not fared as well as we have. It looks this way to me. Suppose I am taking a spin after dinner, I see some one crossing the road. It is a tramp who perhaps is walking slowly because it is a long time since he had any dinner. I would be somewhat of a cad to curse that poor fellow because I have to slow down a bit to avoid hitting him. There is sufficient amount of inequality, misery and injustice in this world without those who are favored emphasizing these wrongs for the unforunate.

"Considering this matter merely on the low plane of policy, courtesy over the telephone is a valuable investment. If I forget myself and speak snappily and sarcastically to those who happen to irritate me, I am building up a bad reputation as a scold and making a large number of unknown yet active enemies. If, however, I take care to speak pleasantly, no matter what the provocation or silliness of the query, I am smoothing out my own pathway at small cost.

"People who flare up on the smallest occasion are always in hot water. They interfere with themselves. They show to others the worst possible side of their characters, besides adding needlessly to the sum of ill temper, sorrow and irritation around them. Not the least unpleasant feature of such conduct is the impossibility of erasing a bad impression once made. You may explain and effect an apparent reconciliation but the scar of injured feelings remains. Invariably those who listen to your labored words, say to themselves: Yes; he tried to explain his boorish conduct when he found out who it was. But if it had been some poor person without influence, he would let him go away without a word. There is hardly an adjunct of modern life that demands more care than the telephone."

"Well," remarked the Doctor, "who would have thought there was so much philosophy in a telephone call?"

"Doctor," said the Sage, "there is nothing so common that you cannot get philosophy out of it if you think awhile."—*The Pilot.*

"Phony" Calls on New York Telephone

You are a busy man. It is true that you spent forty minutes longer at lunch on Saturday talking politics with Jones, and that you missed an important engagement Thursday morning because, when Smith called in for a moment at your office and you got chatting over your new car, you forgot the engagement till it was thirty minutes overdue.

Also, you missed a meeting because you stopped in a crowd at the corner of Broadway and Cedar street long enough to see what the crowd was there for. You're human, of course. But you're a busy man and when you sit down at your desk April 1 and find a memorandum, written in a strange backward hand, reading, "Call Mr. Fish, 3732 Rector," you may not just think, for the moment what day it is.

Of course, the old trick of getting somebody to call Mr. Fish at the aquarium is very old. In the days of old Rameses there were no telephones, or that old joke would have been recorded on papyrus, too. But the age of a joke is no deterrent to some folks with no particular originality, and then they may vary it some. They might tell you that Mr. Lyon or Mr. Monk or Mr. Campbell or Mr. Bird had "been on the telephone," and desired that you should call "Tremont 953." That's the zoo. Or it might have been Mr. Wolff and the number "Bryant 1." Just think of calling Mr. Wolff at The Lambs.

There's the memorandum, "Mr. Mann, Gramercy 5860," the telephone number being that of the Woman's Rights Party. The stern female patriot who might answer your blundering call would not let you off pleasantly because you protest that you're the victim of an April fool joke, she having a serious mission in life. What if you should call for Mr. Love at "Madison 6500." The Martha Washington Hotel?

The list of risky calls for today is a pretty long one. If you call Mr. Skinner, Mr. Baer, Mr. Bull, or Mr. Lamb, see that the number isn't Rector 1400, 2530 or 2700, or Broad 2305. Any of those calls puts you in touch with the Stock Exchange. Mr. Killam's telephone address may lead to a famous pavilion in Bellevue or to some well known physician's office. If you call "Mr. Clews 1803 Cortlandt," you will mystify the great Mr. Burns' office. Mr. Cooke and Mr. Frye may be real personages at 440 Madison, the National Chefs' Union, but more likely not.

The possibilities connected with calls for Mr. Coffin or Mr. Berry, Mr. Dunne, Mr. Goode, Mr. White (say at "Columbus 1965"), Mr. Cutting, Mr. Wood, Mr. Cole, Mr. Train, Mr. Carr, Mr. Lamb, Mr. Stone, Mr. Gold, Mr. Bond, Mr. Banks, Mr. Blume, Mr. Poor, Mr. Gaynor, Mr. Strong, Mr. High, Mr. Flint, Mr. Diamond, Mr. Small, Mr. Brown or Mr. Green are so terrifying, if you just think a moment, that you'll agree that today is a mighty ticklish day on which to call up almost any man who isn't on your regular calling list.

Little Stories of the Telephone

Old Wes Bloodsoe had a curious experience. He was using his party line when he heard a cry, the cry of a woman whose voice he recognized—an old lady that lived half a mile away. He heard her cry aloud, then heard a heavy fall. He rushed to the house, and arrived in the nick of time to prevent a tragedy. What the tragedy was he would never tell, "Jes' a little family matter," he said.

Mrs. Joe Dedman had cried "Wolf" a thousand times—this time she was sure, "Burglars." She lived on the edge of the village with her nearest neighbor a quarter of a mile away.

In her panic she thought of the telephone, but could not find the directory.

"In case of fire call No. 28." She remembered that, and called No. 28. In a very short while the enthusiastic village fire department was hammering at the house, front and back. When they took the burglar in charge he might well have remarked in the historic language of Louis XV, "After me the deluge."

Everything was still at the police station. The desk sergeant, dozed over his evening paper, smoked his pipe, and a couple of officers sat blinking before the fire in the next room. Presently the telephone rang violently. This is what the sergeant heard:

"Come quick to No. 7-2-8-6 South Madison street. I am tied by a burglar." It was a woman's voice. She spoke with muffled indistinctness, yet he understood her perfectly.

The sergeant turned, and his voice snapped like a whip: "Henry, rush four men quick to 7-2-8-6 South Madison street. Something doing!"

Four bicycles slipped away like spectres down the long street, between the shining lights. Stopping a block away from the house the men hurried along on foot, creeping cautiously through the shadows, for they well knew that a man would be on watch outside the house. This watchman gave the alarm and escaped. The burglar dashed out of a rear door, found himself covered by two big pistols and threw up his hands.

"Hold him, Joe!" the sergeant ordered, and rushed into the house.

Upstairs he found a lady bound hand and foot, lying on the floor. She had managed to remove the towel and struggle to the telephone.

Joe and Wesley were slick ducks and were proud of it. They didn't live in the country. They were wise guys and game sports. They wore check shirts and red ties, and each had a cigar tilted upward in his mouth. They stepped into a telephone booth and Joe called "Main 4-9-7-2." Presently the operator said, "Drop in a nickel, please."

"Say, Wes," suggested Joe, feeling in his pocket, "here's a good chance to work off that plugged nickel."

Wes dropped the plugged nickel. The ball rang clear enough, but no answer came over the line—nothing except the operator's pleasant voice, saying, "That nickel was plugged. Drop in a good one, please." Joe gasped, then dropped in a good nickel and had his talk.

"Say, Wes," he whispered, as they left the booth, "do you reckon that gal could see the plug in that nickel all the way from the telephone exchange?"

Telephone Operations in Denmark

The annual report of the telephone company of Copenhagen for 1911 indicates prosperity, says Consul General E. D. Winslow, Copenhagen, Denmark. Receipts from rentals were $1,050,000, from public telephones, $191,000, for removals and entrance fees of new clients $54,000.

Wages paid amounted to $325,000; $290,000 was expended in repairs and betterments; interest charges were $145,000; the income tax took $8,000. There was $270,000 written off for wear and tear. The stockholders received $225,000, or 6 per cent on the par value of their stock; $27,000 was set aside for the pension fund, and the board of directors received $5,000 for their year's labor. The amount written off for deterioriation amounted to 3.3 per cent of the combined stock capital and bonded indebtedness. The government will take over the company in 1918. The Copenhagen Telephone Company operates not only in that city, but also over all the island of Zealand, which includes a territory of 2,000 square miles, with 1,100,000 people.

Gray Pay Station Company to Build

The Gray Telephone Pay Station Company has purchased a lot in Hartford, Conn., where the company will erect a four-story factory building 200 feet long by fifty feet deep. It has a frontage of 210 feet on the railroad tracks and is 230 feet long on the Hawthorne street side. It has a depth of 130 feet, and has a twenty-four foot entrance from Forest street extension.

The company expects to begin building operations at once and hopes to have the building ready for occupancy in December.

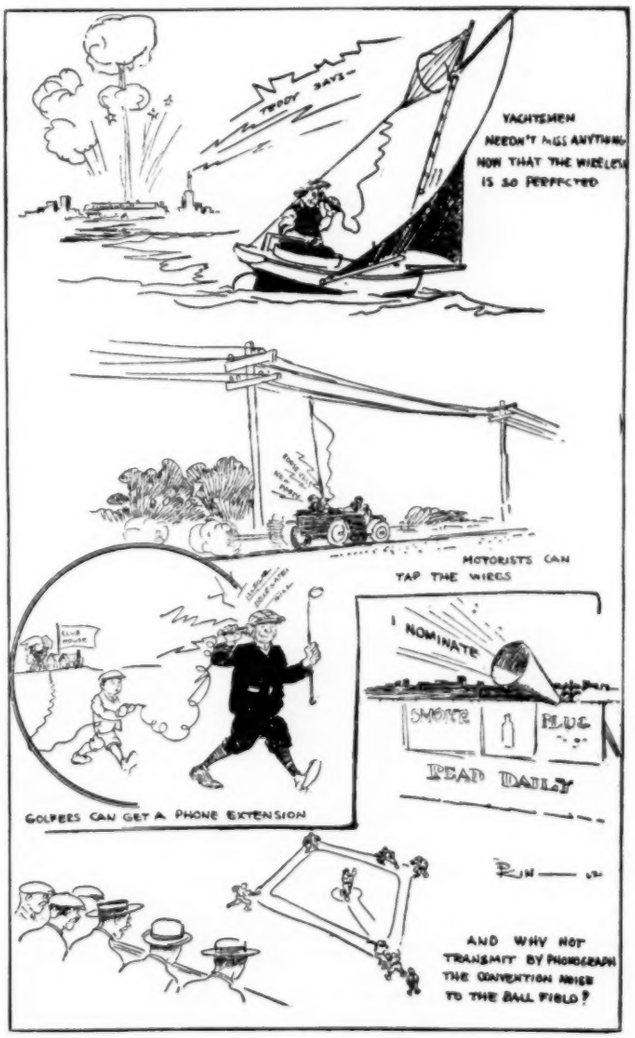
The Chicago office of the Driver-Harris Wire Company is now located in the new Sharples building, Jefferson and West Washington streets, and a complete stock of Nichrome, Climax, Advance, Therlo and other resistance alloys is carried in stock.

Operator Married in Operating Room

A novel wedding ceremony took place at Paris, Texas, when Charles H. Williams and Miss Iva Martin of Detroit were married at a telephone exchange there. The bride was on a trip to Hugo, Okla., and the young man became so lonesome he joined her there and induced her to return with him as far as Paris. They agreed to marry as soon as they arrived and get the lonesomeness over with. Williams telephoned to a preacher. He came to the telephone exchange, where the girl had friends among the operators, and while they were busy connecting callers, the preacher read the service, the operators being witnesses without interrupting their work. After the marriage the pair returned to Detroit.

The Premier Electric Company, Chicago, is handling the Williams time switches, including the line of automatic electric time switches, which turn your lights off and on at any time desired. Write to the Premier Company if you are interested in this line, as every employer is.

"New Uses for Noise"


TEDDY SAYS—
YACHTSMEN NEEDN'T MISS ANYTHING NOW THAT THE WIRELESS IS SO PERFECTED
MOTORISTS CAN TAP THE WIRES
I NOMINATE
SMOKE
HUG
READ DAILY
GOLFERS CAN GET A PHONE EXTENSION
AND WHY NOT TRANSMIT BY PHONOGRAPH THE CONVENTION NOISE TO THE BALL FIELD?

From the *Chicago Daily News.*

Telephone for Mutes

A new telephone for the use of deaf mutes has been invented by William E. Shaw and his wife, both deaf mutes of Lynn, Mass. The telephone comprises an electrical keyboard differing slightly in appearance from that used on a standard typewriter machine.

The machine is connected by wires to an electrical signal board on which are thirty-six incandescent lamps; twenty-four globes bear the letters of the alphabet; twelve of the bulbs numerals. Should one mute wish to call another he presses a key which lights a lamp on the signal board, and talks by pressing the various levers on his keyboard.

An American consul in a Latin-American country reports that negotiations are being conducted with regard to a concession for the establishment of a telephone system in a city of his district. If the negotiations are successful, it will result in a new and complete telephone system. This matter should be investigated by American companies which have the necessary apparatus and equipment for sale. Copy of the complete report, giving further details and the name of the concessionaire, can be secured from the Bureau of Manufacturers, Washington, D. C. File No. 8113.

A European city is about to reorganize its telephone system and to establish ten central exchanges instead of the present outgrown system of one central only. Only local firms will be allowed to compete for the orders to which this work will give rise, but such firms will be permitted to offer equipment materials from foreign countries. One local firm, which proposes to submit tenders, has informed an American consular officer that it desires to get in touch with firms in the United States wishing to offer equipment for central exchanges. Price lists with best terms should be sent immediately direct to this firm, as the tenders are to be made out during June. Correspondence on this subject addressed to the consular officer in question will also be delivered to other local firms of good standing. The address may be obtained from the Bureau of Manufactures, Washington, D. C., file No. 8853.

A telephone company in a foreign country has under construction a public telephone line which will be completed in the near future. Another telephone company in the same country has decided to install a modern telephone exchange for general and exchange business, while a number of extensions will be made by both companies. The names of these companies, together with further details furnished by an American consulate, will be sent to interested firms by the Bureau of Manufactures. Refer to file No. 9028.

An intensely interesting and forceful description of the winning of a baseball game is being distributed, in booklet form, by the Crouse-Hinds Company of Syracuse, N. Y., to its friends in the electrical trade. The booklet is illustrated and printed in two colors. Readers of TELEPHONE ENGINEER who desire a copy of this complimentary booklet can secure one by writing to the Crouse-Hinds Company.

Three-fourths of the telephones of all Asia are in Japan.

Brevities of the Business

PERSONAL NOTES.

P. H. Hopkins has resigned as general commercial superintendent of the western division of the Mountain States Telephone and Telegraph Company, to accept the position of special agent for the Missouri and Kansas Telephone Company, at Kansas City, Mo.

Theodore N. Vail, president of the American Telephone and Telegraph Company, was a recent passenger on the White Star liner Olympic, returning from a three months' trip abroad, most of which time was spent on the Continent, whither he had gone for the purpose of arranging for bettering the transmission of telegraphic and cable messages in the Continental countries.

Shirley M. Lewis, well known in independent telephone circles, has entered the employ of the Kellogg Switchboard and Supply Company as salesman, with headquarters at Terre Haute. Mr. Lewis began his telephone career in the construction department of the Cumberland Telephone Company, Jackson, Tenn., eleven years ago, since which time he has had varied experience, having been engaged in both the manufacturing and operating ends of the business. He comes from the managership of the Stantonville Telephone and Telegraph Company's new common battery exchange at Tupelo, Miss., to assume the duties of his new position.

W. H. Collins, chief inspector in the plant department of the Federal Telephone and Telegraph Company, Buffalo, has been appointed general wire chief of the long distance lines of the eastern division of the company's system, with headquarters at Rush, and Max Lundgren, formerly wire chief at Buffalo, has been made wire chief of the western division, with headquarters at Buffalo.

S. D. Levings, representative of the detail and supply department of the Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa., was a recent caller at the office of TELEPHONE ENGINEER.

Herbert Spencer is the new manager of the Federal Telephone and Telegraph Company's exchange at Medina, N. Y. H. Patterson has been appointed manager at Holley, succeeding C. J. Benjamin, who has been transferred to the maintenance department for special work.

C. G. King, for a number of years manager of the Rome Home Telephone Company, has been appointed manager of the Federal Telephone and Telegraph Company's exchange at East Aurora, N. Y., succeeding F. H. Brace, who will have charge of the company's Springville, Orchard Park, Arcade and Pike exchanges.

Harry C. Wuerth, special agent for the Pacific Telephone and Telegraph Company at Spokane, has been elected acting secretary of the Spokane Chamber of Commerce and secretary of the Inland Empire Federation of Commercial Clubs.

Frank L. Perry, formerly associate editor and advertising manager of the *Western Electrician*, Chicago, has joined the executive staff of the Fidelity Trust Company, Baltimore, where his work will be along the line of general business promotion and publicity for the company, for which his previous experience has well fitted him.

A. W. Surrell has been appointed manager of the Home Telephone Company, Dayton, Ohio, succeeding John H. Ainsworth, who is now representing the Automatic Electric Company in Ohio.

Effective June 1, C. C. Leigh, formerly of Hutchinson, Kans., was appointed traffic chief of the Long Beach, Santa Monica, Redondo and San Pedro offices of the Pacific Telephone and Telegraph Company, with headquarters at Long Beach, Cal.

Buford Adams has been elected general manager of the Brazos Valley Telegraph and Telephone Company at Waco, Texas. Mr. Adams was born in Carrolton, Mo., and began his telephone career as night operator for the Missouri and Kansas Telephone Company during his school days, afterward being em-

ployed as local manager of the company and later was transferred to the position of district manager of the same company at Joplin. Later he was connected with the Colorado Telephone Company of Denver in different important capacities. E. C. Blomyer of St. Charles, Mo., has been appointed secretary-treasurer of the company.

Mr. A. E. McLaren, commercial manager of the Pacific Telephone and Telegraph Company, Eureka, Cal., recently became a member of the Pioneers' Association of America, having opened the first telephone exchange in Eureka in April, 1890.

H. E. McVay, who has been in charge of the Mountain States Telephone Company's interests in Arizona with headquarters at Bisbee, will take up his residence in Tucson, where he will hereafter have his headquarters as state manager for the company. The Mountain States Company recently took over the interests of the Arizona Telephone and Telegraph Company in Arizona.

F. M. Springer, Eureka, Ill., has purchased a controlling interest in the Farmers' Telephone Company in that place.

C. M. Henderson, district and local manager of the Southwestern Telegraph and Telephone Company at Jonesboro, Ark., has been transferred to the company's exchange at Fort Smith. He will be succeeded by H. E. Roberts from Helena.

H. W. Fluhrer, for the past thirteen years superintendent of the Auburn Telephone Company, Auburn, New York, has assumed the duties of general manager of the Otsego and Delaware Telephone Company, Oneonto, New York. He assumed his duties the first of June, but will not move his family until July. It is expected his Auburn position will become vacant within a year as the New York Telephone Company is planning to take over the automatic telephone system of the Auburn Telephone Company. Mr. Fluhrer began his telephone career in Grand Rapids, his native city, and before coming to Auburn in 1899 he was superintendent of a plant at Albion, Mich.

T. A. Ainsworth, local manager of the Kinloch Telephone Company at Bloomington, Ill., has been honored by being elected a director of the company.

J. E. Burke has been appointed district manager of a new district formed by the Cumberland Telephone and Telegraph Company, composed of Morristown, Rogersville, Jefferson City, New Market and Dandridge, Tenn., with headquarters at Morristown. R. R. Andrews is district plant foreman.

R. L. Bennett, who for the last two years has had charge of the Southwestern Telephone Company's office at New Braunfels, Tex., has taken up the management of the company's exchange at San Marcos, Tex., and will be succeeded in his former position by J. H. Platz of that city.

Ralph S. McDaniel, who for some time has held the position of chief clerk of the local Bell Telephone Company, Carthage, Mo., has resigned his position and will become assistant manager of the Webb City Carterville exchanges, under Manager Smith of Joplin. He will reside in Webb City.

P. H. Hopkins, who has served the Rocky Mountain Telephone Company in various prominent positions during the past eleven years, with headquarters at Salt Lake City, has moved to Kansas City, where he will enter the office of General Manager F. L. Gilman of the Missouri and Kansas Telephone Company as special agent. The new position is said to be a marked promotion. Mr. Hopkins entered the employ of the company eleven years ago in the capacity of salesman. His advancement was rapid and he was promoted first to be general collection agent, then general contract and collections agent, and finally general commercial superintendent. The last-named position he held at the time the Mountain States Company was formed, and he continued at the head of the commercial department of the Mountain States Company in the western division until he accepted his present position.

Frank N. Kondolf, president of the Stromberg-Carlson Telephone Manufacturing Company, has been elected president of the Computing-Tabulating-Recording Company of New York City. This company was organized last July to take over the International Time Recording Company, the Computing Scale Company of America, and the Bundy Manufacturing Company, with headquarters in New York. Mr. Kondolf has been president of the Stromberg company for the past three years and in that time has done much to strengthen the position of the company, placing its plant and finances in improved condition. He still retains the presidency.

J. G. McInery of Depere, Wis., has assumed the management of the Antigo Telephone Company at Antigo, Wis., succeeding B. G. Snyder.

W. P. Hemphill, who has been general manager of the Topeka Independent Telephone Company for nine years, has been elected vice-president and general manager of the Southwestern Blaugas Company of Kansas City and will move to that city in a short time to take the active management of the building of the factory and the development of the business. Theodore Gary was elected president of the company.

Charles H. Poole, general manager of the Home Telephone Company, Utica, N. Y., recently gave an informal dinner at the Hotel Utica in honor of D. C. Cox, who is to have charge of the consolidated telephone interests in that city.

D. C. Cox, division general manager of the New York Telephone Company, has been selected for president of the Telephone Society of New York. The society has approximately 4,000 members. They are officers and employes of the American Telephone and Telegraph Company, the New York Telephone Company, the Western Union Telephone Company and the Western Electric Company. Mr. Cox has been vice-president of the society for two years.

D. E. Campbell has joined the D. & T. anchor sales force of the Vote-Berger Company, La Crosse, Wis., and will call on the trade in the central states. He has been in the game for the past nineteen years with Cracraft, Leich Electric Company and the Stromberg-Carlson Company. Being well known and very popular the trade will be glad to know of his new connections. Mr. Campbell is the fourth man to be added to the company's sales force during this year, which gives a good idea of the growth of D. & T. anchor business.

Charles A. Berg, for a number of years manager of the People's Telephone Company, Morgantown, W. Va., and previous to that general manager of the old Tri-State company for several years, is the new manager of the Connellsville district of the Tri-State Telephone Company, Connellsville, Pa.

Frank W. Pardee, vice-president and general manager of the Ericsson Manufacturing Company, Buffalo, N. Y., who has been spending some weeks in Europe, primarily in the interest of business, is expected home about July 1.

On June 1 Ellsworth Keith, manager of the Supply Sales Department of the Automatic Electric Company, Chicago, was married to Miss Maude Lewis Puetz, daughter of Mr. and Mrs. John Carlyle Puetz, Hinsdale, Ill.

Frank B. Hall, the well known construction engineer whose new telephone book was favorably commented upon in these pages some time ago, has been retained by the North Electric Company, Cleveland, Ohio, to make a report on the Galesburg (Ill.), Independent Telephone Company's overhead construction. The appointment grew out of Mr. Hall's success in investigating similar matters in Seattle, Wash.

Warren M. Heim, formerly construction engineer of E. L. Phillips and Company, New York, has associated himself with W. N. Matthews and Brother, St. Louis, in the capacity of sales engineer, in charge of the company's eastern office, 227 Fulton street, New York City. Mr. Heim will devote all of his time to the sale of Matthews "patented money-saving specialties," in the territory east of a straight line drawn through Syracuse, N. Y., and Harrisburg, Pa., and north of the North Carolina state line.

NEW TELEPHONE COMPANIES.

ARKADELPHIA, ARK.—The following well known business men are interested in the organization of a telephone company in this city to install a local telephone system: R. B. F. Key, Capt. C. C. Henderson, T. N. Wilson, R. C. McDaniel. The capital stock of the company will be $25,000. Application will be made to the city council for franchise.

LOCKESBURG, ARK.—A company has been organized in this place with a capital stock of $50,000 for the purpose of establishing a telephone system over the entire county.

LITTLE ROCK, ARK.—The Arch Street Telephone Company of this city has been incorporated with a capital stock of $5,000.

HOT SPRINGS, ARK.—The Arkansas Telephone Company has been incorporated with a capital stock of $100,000.

GAZELLE, CAL.—Farmers residing between Gazelle and Callahan have formed a co-operative telephone company to build a telephone line and have elected the following officers: President, Charles Pitts; vice-president, R. V. Hayden; secretary, Jim Masterson; treasurer, C. G. Stricklin; directors, the above officers and James B. Parker and Wilbur R. Parker.

AUBURN, GA.—The Auburn Telephone Company has been organized with W. H. Carroll, president, and B. O. Crosby, secretary-treasurer, and a local telephone system will be at once installed.

REXVILLE, IND.—The Farmers' Mutual Telephone Company has been incorporated with a capital stock of $5,000. The directors are J. M. Lewis, Michael Hockersmith, G. H. Delay, J. H. Craig, Murray Jackson, J. N. Hess and Henry Hafft.

SATTRE, IA.—The Sattre Telephone Company has been incorporated with a capital stock of $1,500; incorporators, S. J. Thompson, Edward Lund and Thomas Otteson.

ROCK RAPIDS, IA.—Articles of incorporation have been filed for the Farmers' Mutual Telephone Company; capital stock, $10,000. The incorporators are T. F. Collins, H. J. Meester and John Rohiff.

BRECKTON, KY.—Articles of incorporation have been filed for the Breckton Telephone Company with a capital stock of $500. The incorporators are Ed. Redford, Morgan Gilleck and George Lewis.

OLD BAINBRIDGE, KY.—The Old Bainbridge Telephone Company has been incorporated by J. L. Saddler, B. F. Wood and W. D. Olden; capital stock, $500.

GLENDALE, KY.—Eugene Stuart, H. M. Hatels and Garland Ash have incorporated the Glendale Telephone Company; capital stock, $500.

ST. PAUL, MINN.—Articles of incorporation have been filed with the secretary of state for the Height of Land Telephone Company by George W. Brager and Ole N. Eckman of Brager; John Sperling, Benjamin Hammann, Detroit, Mich., and Mark Chamberlain, Senjen, Minn.

VERNDALE, MINN.—The Verndale-Bartlett Telephone Company is a new organization incorporated by Peter Lage and A. K. Anderson of Bartlett. The capital stock is $650.

EAGLE BEND, MINN.—Leander Peterson, Frank Hellgren, August Peterson and others have filed articles of incorporation with the secretary of state for the Eastern Farmers' Telephone Company; capital stock, $9,000.

DEER WOOD, MINN.—The Hamlet and Spirit Lake Telephone Company has been incorporated with a capital stock of $1,000 by Alfred Johnson, Alfred Heglund, F. V. Berglund, C. M. Peterson, Gust J. Landstrom, A. W. Nelson, N. J. Sherlund and Paul B. Bergfalk. The officers of the company are: President, Alfred Johnson; vice-president, Alfred W. Heglund; secretary, F. W. Berglund; treasurer, Gust J. Landstrom.

BLOOMSDALE, MO.—The Bloomsdale Telephone Company has been incorporated in this place by John N. Kertz, Michael Kertz, Peter E. Carron and others with a capital stock of $4,000.

WILLIAMSTOWN, N. J.—The Crescents Orchards Telephone Company has been incorporated with a capital stock of $10,000. James Moon of Morrisville, Pa., is one of the incorporators.

LIVINGSTON MANOR, N. Y.—The Livingston Manor Telephone Company has been incorporated by James G. Stevens, W. R. Woolsey and Robert J. Hoag with a capital stock of $3,600.

RICHVILLE, N. Y.—Articles of incorporation have been filed for the Richville Telephone Company by Adelbert A. Gates and A. Fred Spooner of Richville, and Manley E. Johnson of Bigelow; capital stock, $9,000.

PARIS, O.—The L. S. Higdon Telephone Company has been incorporated by Jake Deckard, Babe Meredith, James Meredith, Alex Van Meter and W. H. Miller; capital stock, $800.

VANOSS, OKLA.—The Vanoss Telephone Company has been incorporated with a capital stock of $1,000. The incorporators are A. H. White, H. L. Brooks and J. S. Jones. Mr. White is president of the company and Mr. Brooks secretary.

STRINGTOWN, OKLA.—The Citizens' Telephone Company has been incorporated with a capital stock of $2,000. The incorporators are O. A. Moody, M. R. Winters and O. C. Elkins.

LEROY, PA.—The Leroy Telephone Company has been incorporated with a capital stock of $5,000.

MURFREESBORO, TENN.—A local telephone company was recently organized and the following officers elected: President, G. S. Smith; vice-president, B. M. Rucker; treasurer, R. G. Moffett; secretary, H. C. Moore, Jr. The Home Telephone Company has an exchange at Lascassas, eight miles from this city and it is proposed to extend it to this place and later to Nashville. The board of directors was instructed to secure a charter and also to secure a franchise from the municipal government and the company expects to have its system in operation in a short time.

ROCKWELL, TEX.—The Rockwell Telephone Company has been incorporated with a capital stock of $10,000 by J. R. Thaxton, J. W. Thaxton and Chester White.

POST, TEX.—The Garza Telephone Company has been incorporated with a capital stock of $15,000 by C. W. Post and others.

HIGGINS, TEX.—The Arnett Telephone Company, Arnett, Okla., has been granted permission to do business in Texas with principal office at Higgins; capital stock, $10,000.

MAYLAND, VA.—The Mayland Switch Company has been incorporated by Paul E. Rinehart, J. W. Pickering, D. W. Whitmer, I. N. Zigler and H. F. Phillips, all of Broadway; capital stock, maximum, $3,000; minimum, $1,000.

TROUT LAKE, WASH.—The Farmers' Union Telephone Company has been organized with a capital stock of $50,000 and will be incorporated. John Weingardner is president of the company, E. E. Wright, treasurer, and H. N. Williams, secretary.

FARMINGTON, WASH.—Articles of incorporation have been filed for the Farmington Rural Telephone and Telegraph Company.

SPOKANE, WASH.—The Inland Telephone and Telegraph Company has been incorporated with a capital stock of $250,000. The incorporators are John W. Fisher and William G. Barlow.

RIPON, WIS.—The Ripon United Telephone Company has been incorporated by G. F. Horker, J. B. Barlow, Jr., and S. M. Pedrick with a capital stock of $40,000.

ATWOOD, WIS.—Articles of incorporation have been filed for the Atwood Telephone Company by William Rusch, William Hardrath, Fred Molle, David Mandel, Edward Klessig and Henry Molle; capital stock, $600.

BARNES, WIS.—The Barnes Telephone Company has been incorporated with a capital stock of $2,000. The incorporators are George S. Barnes, Horace L. Barnes and May Barnes.

OGEMA, WIS.—August Haden, A. W. Nelson, A. Struve, George Dahl and O. V. Soderstrom are the incorporators of the Ogema Telephone Company; capital stock, $3,500.

FINANCIAL ITEMS.

FLANAGAN, ILL.—The capital stock of the Flanagan Telephone Company has been increased from $1,400 to $2,000.

PETERSBURG, IND.—At a meeting of the stockholders of the Pike County Telephone Company the capital stock was increased from $50,000 to $100,000 by the issue of $50,000 preferred stock and bonds. The company has been granted a franchise in Washington and is seeking one in Vincennes.

NEW YORK, N. Y.—The New York Telephone Company has secured permission from the Public Service Commission to issue $5,000,000 par value of first and general mortgage 4½ per cent gold sinking fund bonds and to sell them for not less than 96 per cent net, the proceeds to be used entirely within the state. In addition to this the company is to issue $25,000,000 other bonds, $20,000,000 of which is to be used for the purchase of the Bell Telephone Company's plants in Virginia and West Virginia and for construction and improvements of facilities outside of the State of New York.

ARCHBOLD, O.—The Archbold Telephone Company has increased its capital stock from $20,000 to $35,000.

IRONTON, O.—The capital stock of the Home Telephone Company has been increased from $50,000 to $100,000, all common.

CINCINNATI, O.—The Ohio Public Service Commission has granted the Cincinnati Bell Telephone Company permission to issue $580,000 additional stock to finance the purchase of property for its main exchange and offices, as well as a new switchboard, and also to provide additional working capital. The St. James Hotel, Fourth avenue and Hammond street, will be selected as the site for the new telephone building.

NEW KNOXVILLE, O.—The capital stock of the New Knoxville Telephone Company has been reduced from $8,750 to $7,500.

LEITCHFIELD, O.—The capital stock of the Yeaman Mutual Telephone Company has been increased from $1,000 to $10,000.

JOHNSTOWN, PA.—With the intention of extending its service to every town and community depending upon Johnstown as a trading center, the board of directors of the Johnstown Telephone Company has authorized the issuance of new stock to the amount of $100,000. The funds thus provided will be used in construction work.

WINTERS, TEX.—The Independent Telephone Company of this place contemplates many improvements and it is stated for this reason the capital stock of the company will be increased from $15,000 to $50,000.

BRYAN, TEX.—The Bryan Telephone Company has filed an amendment increasing its capital stock from $14,000 to $28,000.

FRONT ROYAL, VA.—The Royal Telephone Company has amended its charter, increasing its capital stock from $5,000 to $10,000.

RATES.

SAN FRANCISCO, CAL.—The State Railroad Commission has obtained from the Pacific Telephone and Telegraph Company a cut tof 33⅓ per cent in toll charges between San Francisco and the cities of Oakland, Alameda and Berkeley. The present rate is 15 cents for a conversation of three minutes and beginning July 1 this rate will be cut to 10 cents for a conversation of three minutes. E. C. Bradley, vice-president and general manager of the company, is authority for the statement that this will mean a reduction of $30,000 a year in the telephone bills of the

people in San Francisco and the three cities in Alameda county.

RAYMOND, CAL.—The Raymond Telephone Company has applied to the State Railroad Commission for permission to increase rates on the lines between Raymond and the Pines via Coarse Gold and Fresno Flats.

LOS ANGELES, CAL.—The Home Telephone Company has filed with the city clerk a protest against each and every item of telephone rates as fixed by the board of public utilities. The Sunset Company has also filed a general protest, so that a public hearing must be given by the city council.

SHELBYVILLE, IND.—The Central Union Telephone Company has announced an increase in party line tolls from $1 a month to $1.25, which has inspired several young business men to plan the organization of an independent telephone company in this place.

FORT DODGE, IA.—An effort to raise telephone rates in Fort Dodge has been put under way by the Fort Dodge Telephone Company. Under a long time franchise which has still twelve years to run, the company is required to maintain the rates at $2 for business telephones and $1 for residence telephones and as a result the service has become obsolete. After investigating the situation the commercial club favors a raise. The company has sent out a circular letter stating the case and asking patrons to vote yes or no regarding the proposed raise in rates. If the majority wish the rate revision and the service improved the company will take measures to procure a $75,000 investment in new, modern building and up-to-date equipment.

HUTCHINSON, KANS.—The Langdon Telephone Company has filed an application with the public utilities company for permission to raise a switching rate with rural telephone lines. The Arlington Telephone Company has made application for an increase of rates.

BALTIMORE, MD.—Claiming that other large cities are receiving unlimited telephone service at rates said to be lower than those which obtain under the new limited system in Baltimore, Dr. A. R. L. Dohme, president of the Protective Telephone Association of Baltimore, has addressed letters to members of the organization asking them to co-operate in continuing the fight for lower rates in this city and plans are being made for an appeal to the Public Service Commission for a readjustment of telephone charges.

STANDISH, MICH.—The people of this city are up in arms over the contemplated raise of 50 cents per month in rates, making a rate of $1.50 per month.

MANISTEE, MICH.—The Michigan State Telephone Company has raised its rates, the same becoming effective July 1st. The company claims this step has been made necessary as the plant has been a losing proposition. Mayor Hull, indorsed by the board of trade, has called a mass meeting to consider the matter, and there has been talk of an independent company.

TECUMSEH, NEB.—The Lincoln Telephone and Telegraph Company, which recently took over the telephone lines in this vicinity, has increased the rates, which is being opposed. A mass meeting was held in this place, at which a petition of protest was signed and a committee consisting of J. C. Moore, W. A. Apperson and S. W. Thurber was appointed to present it to the railway commission. It is said that many of the farmers in the county will put in systems of their own if the company persists in raising prices. In places where business men have heretofore been compelled to use the two systems there is no objection to the increase, as they feel the expense will still be less than before the consolidation, or but slightly in advance, and the service better. The Lincoln company now owns the lines formerly owned by the Johnson County Home company and the Bell company.

OCONTO, NEB.—The Oconto Telephone Company has been granted permission to increase rates as follows: On business telephones from $1.50 to $2.00; farm line switching service, 20 or 30 cents.

SYRACUSE, N. Y.—The management of the Telephone Protective Association of Syracuse is to be vested in a board of directors composed of twelve members, who are to elect the officers. It is proposed to invite representative business and professional men to serve in this capacity. This provision is a new feature of the plan for an organized fight against increased telephone rates in Syracuse. According to the constitution the association is organized to urge legislative enactment placing the maximum charge for business telephones at $48 per year and residence $30 per year; and is empowered to take any and all means necessary to establish satisfactory rates. The officers are to serve without compensation.

SPARTANBURG, S. C.—The Southern Bell Telephone Company has filed a petition with the railroad commission for permission to increase the rates in Spartansburg 50 cents per month for each telephone, on condition that about $150,000 be expended in improving the service, which will include a new telephone building and the placing of all wires underground.

BUFFALO, N. Y.—The question of telephone rates has been referred to the Public Service Commission for investigation.

ASHLAND, WIS.—The Home Telephone Company asks for permission to double the residence rate to $2 for one-party line, $1.50 for two-party line and $1.25 for four-party lines. It also wants the one-party business telephone increased to $3 per month, the two-party business telephone to $2.50 and the four-party business telephone to $2 per month. The railroad commission filed its estimate of the physical valuation of the property, placing the amount at $42,000, preliminary to deciding the question of increase.

FRANCHISES ASKED AND GRANTED.

WASHINGTON, IND.—The Pike County Telephone Company has been granted a franchise in this place.

ST. PETER, MINN.—The Nicollet County Telephone and Telegraph Company has accepted the franchise adopted by the council and authorized the board of directors to install an up-to-date central energy system at an estimated cost of $25,000. Plans have been prepared and work will begin at once. At its annual meeting the company elected the following officers: President, M. B. Johnson; vice-president, C. C. Nelson; secretary and manager, C. W. Carpenter; treasurer, F. M. Donahower.

BUTTE, NEB.—The Boyd Mutual Telephone Company has secured a franchise to install a telephone system in this town.

MEMPHIS, TENN.—The board of city commissioners has ratified the franchise contract of the American Telephone and Telegraph Company, giving the corporation the right to operate in Memphis for twenty years, following an agreement by the company to pay $2,500 to the city covering pole rental extending back several years.

ROCKWALL, TEX.—Mr. Thaxon of Venus has been granted a franchise to install a telephone system in this place for which purpose the Rockwall Telephone Company has been incorporated.

TACOMA, WASH.—The Pacific Telephone and Telegraph Company has made application for a new franchise in this city, to run for twenty-five years, and to take the place of the franchise now held by the Sunset company and also the place of the franchise of the Home Telephone Company, which the city council has revoked.

MISCELLANEOUS.

FORT SMITH, ARK.—The Southwestern Telephone and Telegraph Company has appropriated $45,000 for improvements and extensions in Fort Smith.

WALNUT RIDGE, ARK.—The Lawrence County Telephone Company, operating exchanges at Hoxie, Black Rock, Portia and this place, has been purchased by the Southwestern Telephone and Telegraph Company.

GLOBE, ARIZ.—The Mountain States Telephone Company has taken over the holdings of the Arizona Telephone and Telegraph Company, the purchasing price being $2,000,000.

PASADENA, CAL.—The Pacific Telephone and Telegraph Company has petitioned the State Railroad Commission for permission to purchase the plant and capital stock of the Home Telephone Company of this city, the price mentioned being $370,000.

ELGIN, ILL.—It is claimed one of the biggest telephone deals ever known in Lake County and Northern Illinois was consummated when the Chicago Telephone Company recently took over the property of the Lake County Telephone Company.

SPRINGFIELD, ILL.—At the annual meeting of the Illinois Clearing House of Toll lines of Independent Telephone Companies, the following officers were elected: President, Fred A. Dolph, Aurora; vice-president, J. W. Collins, Decatur; secretary and manager, H. B. Gilmore, Springfield; treasurer, E. D. Glandon, Pittsfield; directors, O. M. Irwin, Macomb; J. W. Barrett, Pekin; L. A. Herrick, Freeport; Manford Savage, Champaign; F. C. Wood, Galesburg; W. S. Fisher, Kankakee; W. W. Holliday and A. F. Loehr, Carlinville; T. Ainsworth, Bloomington; E. D. Boynton, Pleasant Plains; S. W. Tracy, Chicago, and L. F. Heiniman.

ANDERSON, IND.—Stockholders of the Delaware and Madison Counties Telephone Company in this city recently adopted a resolution for the sale of the company's exchanges in this city and also Muncie, Elwood, Alexandria and rural lines.

ELDORA, IA.—At the annual meeting of the Eldora Mutual Telephone Company the following officers were elected: President, Thomas Larson; vice-president, C. A. Reaver; secretary,

Helen Hall; treasurer, W. E. Rathbone. The company declared a 4 per cent dividend.

DES MOINES, IA.—The proposition of Henry Riegelman to organize a mutual telephone company to install an automatic telephone system in this city, is meeting with opposition from the Iowa Telephone Company, and the company has asked for a delay of sixty days in which to demonstrate the efficiency of the company's equipment. Mr. Riegelman was one of the organizers of the old mutual telephone system. He has announced his intention of going east to interview the manufacturers of telephone equipment with a view to getting estimates and cost of apparatus.

KENTON, O.—The Ohio public service commission has given the Kenton Telephone Company permission to purchase the Kenton property of the Central Union Telephone Company and the company was also given permission to issue $22,400 additional stock.

ORWELL, O.—The Orwell Telephone Association has elected the following directors: J. F. Stevens, John Reeves, George L. Kingdom, C. H. Wolcott, Charles Merryfield, S. E. Cook, F. W. Parker.

LORAIN, O.—At its annual meeting the Black River Telephone Company re-elected the following officers: President, E. M. Pierce; vice-president, William Honecker; secretary, L. A. Fauver; assistant secretary, H. E. Hageman; treasurer, A. V. Hageman; superintendent, J. R. Preble.

CHESTER, S. C.—The Chester Telephone Company will completely overhaul its plant, installing a central energy system. The work will be in charge of John M. Bell, superintendent of the company.

DEADWOOD, S. D.—The Nebraska Telephone Company is arranging to load its copper circuit wires from this place to Hot Springs connecting with one being built from Alliance to that place, and this will make a loaded wire to Omaha. The same will be done between Rapid City and Pierre and a copper circuit will be installed from Presho to Pierre, making complete copper circuit between Sioux City, Sioux Falls and Deadwood.

UVALDE, TEX.—The Uvalde, Del Rio & San Antonio Telephone Company has elected the following directors: W. R. Hooper, president and general manager; L. A. Field, W. T. Childress, T. P. Isbell and F. M. Getzendaner.

MEXIA, TEX.—The Mexia Telephone Company has been purchased by the Southwestern company, the consideration being in the neighborhood of $25,000.

SEATTLE, WASH.—A deed has been filed transferring the property of the Independent Telephone Company to the Pacific Telephone and Telegraph Company.

WHEELING, W. VA.—The proposition of J. H. Vercoe of this city for a reorganization of the National Telephone Corporation and its subsidiaries has been approved by a committee composed of Robert C. Dalzell and J. A. Hess of Wheeling, R. C. Hall of Pittsburgh, J. W. Barnes of Fairmont and C. W. Bentley of Parkersburg. The plan provides for the organization of three new companies to be known as the West Virginia company, the Ohio company and the Pennsylvania company, all of the stock of which is to be owned by a fourth company, to be known as the holding company and to have a capitalization of $500,000. The new deal includes some sixteen separate companies.

WHEELING, W. VA.—Judge A. G. Dayton of the United States court for the district of Northern West Virginia has removed W. C. Handlan as receiver for the National Telephone Corporation and appointed Arnold C. Scherr of Charleston in his stead.

MILWAUKEE, WIS.—At the annual meeting of the stockholders and directors of the Wisconsin Telephone Company it was decided to spend $1,500,000 during the present year in improving the property and service of the company. The following officers were elected: President, B. E. Sunny, Chicago; first vice-president and treasurer, Alonzo Burt, Chicago; second vice-president, B. W. Trafford; secretary, C. E. Mosley; assistant secretary, G. M. Hubbard.

RYAN, WIS.—The Ryan Farmers' Telephone Company has elected the following officers: President, Fred Arians; vice-president, Herman Griese; secretary, Richard Shinnick; treasurer, Matt Marcidek.

SPOKANE, WASH.—Lindsley Brothers Company of this city have installed a plant in their yards at Priest River, Idaho, for the treatment of poles. The plant has a capacity of 300 poles a day. This is the second plant operated by the company, the other one being in Spokane. The company but recently completed an order of 40,000 ties for the Washington Water Power Company and has a number of orders for spring delivery.

SUNNYSIDE, WASH.—At the annual meeting of the Sunnyside Telephone Company the following officers were elected: President, J. J. Brown; vice-president, George Rodman; secretary, F. J. Taylor; trustees, the above officers and U. G. Merrill, Austin Woodyard, O. W. Middleton, Victor Stover.

MAYNARD, IA.—The local telephone system, formerly owned by the Corn Belt Telephone Company, has been purchased by the Farmers' Mutual Telephone Company.

FREDONIA, KANS.—The Fredonia Telephone Company has completed plans for rebuilding its system and contemplates the expenditure of about $25,000 in the next two years. The improvements will include a new exchange building.

READING, MICH.—C. G. Fitzsimmons has secured a controlling interest in the Central Telephone Compnay of this place and plans a number of improvements during the summer. J. F. Fitzsimmons becomes president of the company and C. G., vice-president and general manager.

HOLLAND, MICH.—The Drenthe Independent Telephone Compay has elected the following officers: President, H. A. Lanning; vice-president, B. Ter Haar; secretary, treasurer and manager, Dr. A. J. Brower.

RUSHMORE, MINN.—The Farmers' Mutual Telephone Company has been purchased by the Fulda Telephone Company and the new owners will put in about $10,000 worth of improvements.

SKIDMORE, MO.—The Nodaway Valley Telephone Company of this place will consolidate with the Farmers' Mutual under the title of the Consolidated Telephone Company.

ANACONDA, MONT.—At the annual meeting of the stockholders of the Montana Independent Telephone Company the following officers were elected: President, T. S. Lane; vice-president, John McGinniss; treasurer, Henry P. Bennett; secretary, John F. Davies; general manager, H. R. Risley; directors, the above officers and H. A. Gallwey, C. J. Kelly, J. J. Flanigan, Louis Dreidilbis, F. W. Buff, D. J. Fitzgerald, Patrick Wall and C. S. Jackman. The report submitted by Mr. Buff shows that the company is now entirely out of debt. The company now has 8,570 telephones in service, a gain of 1,216 during the year ending April 30. The gross income for the year was $278,673.89.

BLUE SPRINGS, NEB.—The property of the Lincoln Telephone and Telegraph Company in this place has been purchased by the Blue Springs Telephone Company, which contemplates many improvements during the next few months.

NORFOLK, NEB.—The independent telephone system at this place has been purchased by Theodore Parmalee of Plattsmouth for $22,000.

ALBANY, N. Y.—The Public Service Commission, second district, has received notification from the Skaneateles Telephone Company that it has sold and conveyed its physical property and business to the New York Telephone Company for the sum of $20,700.

SYRACUSE, N. Y.—The New York Telephone Company has begun the work of consolidating its lines with those of the independent telephone system, but the task will likely not be completed before September 1.

PENN YAN, N. Y.—At the annual meeting of the Friend Telephone Company the following officers were elected: President, James G. Alexander; manager, James Sprague; vice-president, W. Miner Taylor; secretary, Chester C. Culver; treasurer, M. G. Davis

HILLSBORO, N. D.—At its annual meeting held recently in the assembly room of the court house in this city, the Traill County Telephone Company elected the following officers: President, A. G. Foogman; vice-president, John E. Paulson; secretary and treasurer, P. S. Peterson; assistant secretary and manager, A. T. Nicklawsky; directors, the above officers and in addition C. C. Dalrymple, Andrew Knutson, A. T. Kraabel and M. L. Elken.

DEADWOOD, S. D.—During the present year the Nebraska Telephone Company will spend over $50,000 in improvements on its lines and property in the Black Hills. This work will be done on the loaded lines between Hot Springs and Deadwood and Presho and Murdo and Rapid City and Pierce. New cables will be installed in the Lead district and the Spearfish-Tinton line will be rebuilt.

TEXARKANA, TEX.—The Texarkana Telephone Companyy has been taken out of the hands of the receiver and the following officers elected: President, J. J. Lentz; secretary, J. F. Rochelle; vice-president, treasurer and general manager, A. C. Stuart.

OZONA, TEX.—The Bennet Telephone System at this place has been purchased by the Rio Grande Telephone Company, operating at Alpine and Fort Stockton for $50,000.

WAXAHACHIE, TEX.—A deal has been consummated whereby all the property of the Ellis County Independent Telephone Company has been taken over by Ben C. Hyde and associates.